

DEPARTMENT OF AGRICULTURE
CANADA

REPORT

OF THE

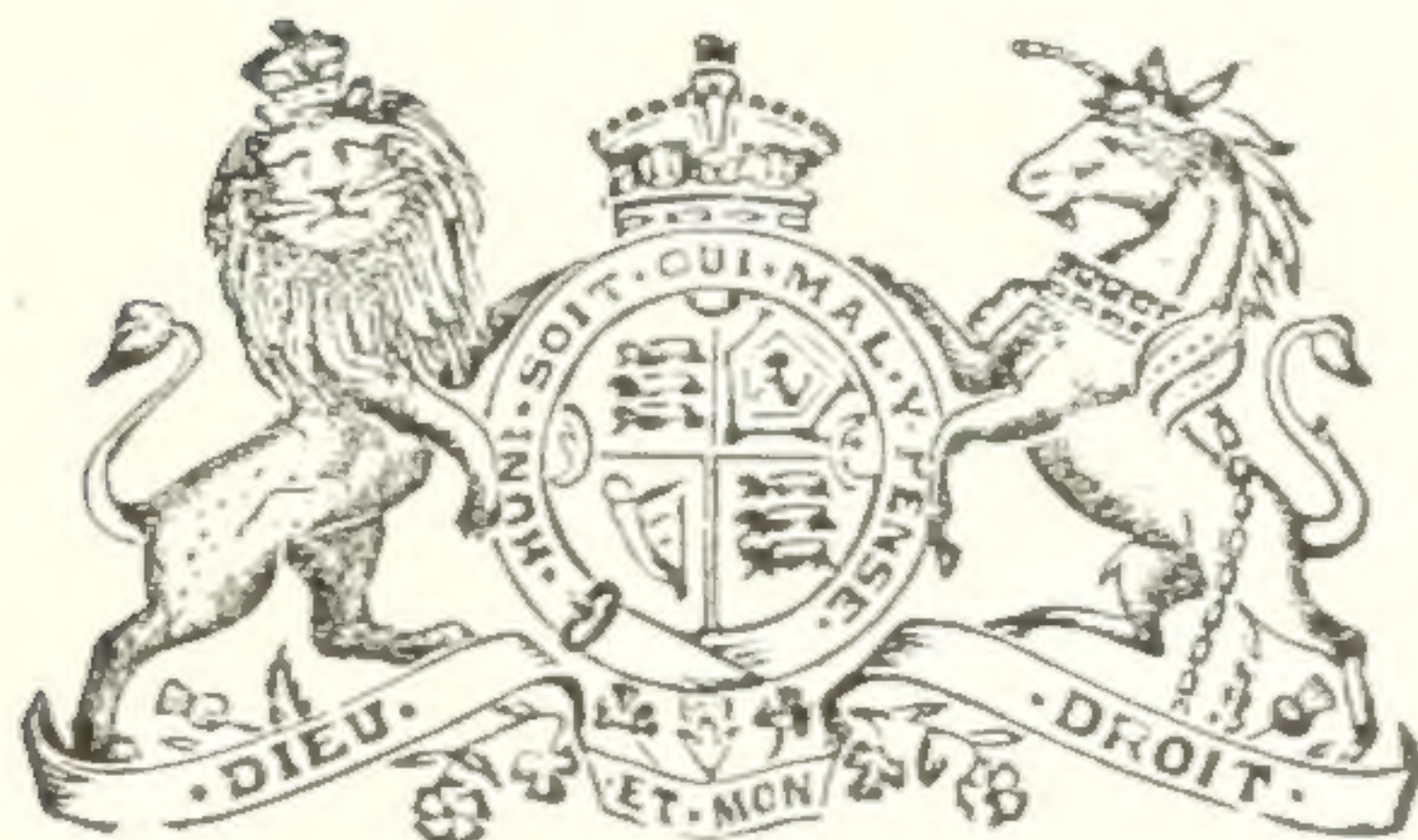
VETERINARY DIRECTOR GENERAL

(F. TORRANCE, B.A., D.V.S.)

FOR THE

Year Ending March 31, 1915

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OTTAWA

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1916.

REPORT

OF THE

VETERINARY DIRECTOR GENERAL

HEALTH OF ANIMALS BRANCH,

OTTAWA, March 31, 1915.

SIR,—I have the honour to present my report as Veterinary Director General for the year ending March 31, 1915.

The past year has been marked by the occurrence in the United States of the most severe outbreak of foot-and-mouth disease in the history of that country. Situated as we are, with four thousand miles of continuous boundary, and with a vast interchange of commodities, including animals and their products, the presence within their borders of such a highly communicable disease as foot-and-mouth disease could only be viewed with alarm. Prompt measures were adopted to exclude all dangerous carriers of infection and to surround the traffic in other less dangerous commodities with all the safeguards that prudence could suggest. It is gratifying to report that at this date no case of the disease has been found in Canada, and that the danger of the spread of infection is lessening from day to day. In order to cope with the extra work entailed in carrying out the regulations, and to guard our boundary against this disease, it has been necessary to add to our staff a number of men for this special duty. These can be dispensed with when the danger is over.

The present war has had its effect upon the work of the branch. Many of our veterinary inspectors have felt it their duty to obey the call to arms, and are now on active service. This has caused the branch to be short-handed, and although several appointments have been made from time to time, it has often been difficult to carry on the work, and would have been well-nigh impossible had not every member of the staff been willing to do even more than his duty.

Notwithstanding these difficulties, the work of the branch has been performed efficiently. Progress is reported in every line, as will be seen in the following detailed statement of the diseases dealt with:—

GLANDERS.

A further reduction is to be noted in regard to this disease. Four provinces have been entirely free from it during the period covered by the statistics. The great majority of the cases have occurred in the provinces of Saskatchewan and Alberta, which have also obtained by far the larger portion of the immigration to Canada. The influx of new settlers attracts the horse-dealer to supply the necessary horses for

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tilling the soil. These horses are often brought long distances by train, and exposed to the most favourable conditions in car and stable for the spread of infection should it happen to be present. The dispersal of these horses among buyers from various localities may disseminate the infection very widely, and if, as is often the case, the newcomer, through ignorance of our laws, fails to notify our officers of the existence of disease, it may become widely spread before reaching our notice. These appear to be the chief reasons for the difficulty of suppressing glanders in these prairie provinces, and we might add, the immense area to be covered by a limited number of inspectors.

DOMINION.

1 killed on inspection.
 285 killed at first test.
 46 " second test.
 6 " third test.

338 (valued at \$53,335, at a cost of \$35,556.65.)

100 showed clinical symptoms.

8,781 horses were tested with mallein, of which 337 reacted and were destroyed. Of the 337 reactors, 99 showed clinical symptoms of glanders at or during the test.

110 horses are under control for retest.

Of the above 338 horses slaughtered, 5 were killed without compensation as being diseased when imported into Canada.

PRINCE EDWARD ISLAND.

1 horse was tested and proved to be healthy.

NOVA SCOTIA.

136 horses were tested and proved to be healthy.

NEW BRUNSWICK.

97 horses were tested and proved to be healthy.

QUEBEC.

14 killed at first test.
 3 " second test.

17 (valued at \$2,870 at a cost of \$1,913.33.)

11 showed clinical symptoms.

448 horses were tested with mallein, of which 17 reacted and were destroyed. Of the 17 reactors 11 showed clinical symptoms of glanders at or during the test.

No horses are under control for retest.

Of the 17 horses slaughtered—

2	were	in	the	electoral	district	of	Beauce.
1	was	"	"	"	"	Chicoutimi	and Saguenay.
1	"	"	"	"	"	Laval.	
12	were	"	"	"	"	St. Hyacinthe.	
1	was	"	"	"	"	Temiscouta.	

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ONTARIO.

847 horses were tested and proved to be healthy.

MANITOBA.

38 killed at first test.

7 " second test.

45 (valued at \$7,970 at a cost of \$5,313.33.)

13 showed clinical symptoms.

1,294 horses were tested with mallein, of which 45 reacted and were destroyed.

Of the 45 reactors 13 showed clinical symptoms of glanders at or during the test.

8 horses are under control for retest.

Of the 45 horses slaughtered—

24 were in the electoral district of Brandon.

18 " " " " Dauphin.

1 was " " " " Lisgar.

2 were " " " " Winnipeg.

SASKATCHEWAN.

155 killed at first test.

28 " second test.

3 " third test.

186 (valued at \$28,530 at a cost of \$10,020.)

52 showed clinical symptoms.

3,845 horses were tested with mallein, of which 186 reacted and were destroyed.

Of the 186 reactors 52 showed clinical symptoms of glanders at or during the test.

27 horses are under control for retest.

Of the 186 horses slaughtered—

10 were in the electoral district of Assiniboia.

10 " " " " Battleford.

34 " " " " Humboldt.

10 " " " " Mackenzie.

43 " " " " Moosejaw

1 was " " " " Prince Albert.

12 were " " " " Qu'Appelle.

45 " " " " Regina.

21 " " " " Saskatoon.

186

ALBERTA.

1 killed on inspection.

63 killed at first test.

5 " second test

3 " third test.

72 (valued at \$11,615 at a cost of \$7,743.33.)

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18 showed clinical symptoms.

1,603 horses were tested with mallein, of which 71 reacted and were destroyed. Of the 71 reactors 17 showed clinical symptoms of glanders at or during the test.

68 horses are under control for retest.

Of the 72 horses slaughtered—

44	were in the electoral district of	Calgary.
25	“ “ “ “	Medicine Hat.
3	“ “ “ “	Red Deer.
—		
72		

BRITISH COLUMBIA.

15 killed at first test.

3 “ second test.

—

18 (valued at \$2,350 at a cost of \$1,566.66.)

6 showed clinical symptoms.

510 horses were tested with mallein, of which 18 reacted and were destroyed. Of the 18 reactors, 6 showed clinical symptoms of glanders at or during the test.

7 horses are under control for retest.

All of the 18 horses slaughtered were in the electoral district of New Westminster.

HOG CHOLERA.

This disease continues to give us much trouble and anxiety and to cause serious losses in the districts where it appears. Prompt notification of the existence of the disease is essential to successful control work, and this is difficult to obtain. Farmers are apt to put off notifying our officers until they have lost several hogs, and by this time the disease has usually invaded neighbouring herds, making its eradication difficult and expensive. In my opinion, a great reason for the delay in notification of the disease lies in the fact that the compensation allowed for hogs slaughtered under the Animal Contagious Diseases Act is low compared with the actual value of hogs at the present time. Ten dollars is the maximum compensation paid for a grade hog, and as the owner usually has sows worth very much more than that, he takes a chance that the disease is not hog cholera and puts off notifying our officer for several days, during which the infection spreads to adjoining premises.

The practice of feeding garbage is responsible for many outbreaks, and as the persons engaged in this business are often foreigners, sometimes Chinamen, it is difficult to get them to notify us of the existence of disease. Steps should be taken to place garbage feeding under such restrictions that some control could be maintained.

Dominion.—In the Dominion, 34,779 hogs, valued at \$295,471.93 were destroyed as diseased, at a cost of \$196,981.28 in compensation.

Nova Scotia.—In Nova Scotia, one owner's premises were quarantined on account of suspected hog cholera, involving the control of 513 hogs.

New Brunswick.—Two outbreaks of hog cholera occurred in New Brunswick in which 33 hogs, valued at \$417, were destroyed in the electoral district of Westmorland, at a cost of \$278 in compensation.

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One owner's premises were also quarantined on suspicion, involving the control of 200 hogs.

One hog, valued at \$15, was destroyed for purposes of examination, but no evidence of hog cholera was found.

Quebec.—Nine outbreaks of hog cholera occurred in Quebec in which 1,291 hogs, valued at \$14,063.50, were destroyed in the undermentioned districts at a cost of \$9,375.66 in compensation.

Seventeen premises were also quarantined on suspicion, involving the control of 876 hogs.

One hog, valued at \$15, was destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of Outbreaks.	Hogs Destroyed.
Chicoutimi and Saguenay	1	332
Jacques Cartier	1	50
Laval	1	32
Montmorency	1	380
Quebec ..	2	401
St. Johns and Iberville	1	3
Terrebonne	1	85
Wright	1	8
	9	1,291

Ontario.—Five hundred and thirty-seven outbreaks of hog cholera occurred in Ontario, in which 16,330 hogs, valued at \$135,477.33 were destroyed in the undermentioned districts at a cost of \$90,318.22 in compensation.

Two hundred and eighty-six premises were also quarantined on suspicion, involving the control of 8,761 hogs.

Four hogs, valued at \$38, were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of Outbreaks.	Hogs Destroyed.
Carleton.	2	187
Essex, N.R.	6	142
Essex, S.R.	222	7,372
Frontenac	14	608
Kent, E.R.	22	582
Kent, W.R.	177	5,651
London	1	7
Middlesex, E.R.	2	53
Ontario, S.R.	1	11
Oxford, S.R.	21	420
Peel	1	22
Russell	17	426
Thunder Bay and Rainy River	35	290
Welland	2	47
Wentworth	5	303
York, C.R.	9	209
	537	16,330

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Manitoba.—Twenty-six outbreaks of hog cholera occurred in Manitoba in which 844 hogs, valued at \$8,652, were destroyed in the undermentioned districts at a cost of \$5,768 in compensation.

Twenty-one premises were also quarantined on suspicion, involving the control of 308 hogs.

One hog was destroyed without compensation for purposes of examination, but no evidence of hog cholera was found.

District.	No. of Outbreaks.	Hogs Destroyed.
Dauphin.....	1	19
Lisgar	2	30
Macdonald	1	106
Portage-la-Prairie.....	1	20
Provencher	9	113
Selkirk.....	4	82
Souris.....	3	74
Winnipeg	5	400
	26	844

Saskatchewan.—One hundred and eighty outbreaks of hog cholera occurred in Saskatchewan in which 4,349 hogs, valued at \$37,722.30 were destroyed in the undermentioned districts at a cost of \$25,148.20 in compensation.

One hundred and four premises were also quarantined on suspicion, involving the control of 2,950 hogs.

Fifty hogs, valued at \$319.60, were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of Outbreaks.	No. Destroyed.
Assiniboia.....	78	1,713
Battleford.....	1	62
Humboldt	2	8
Moosejaw	16	278
Regina	58	1,454
Saskatoon	25	834
	180	4,349

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Alberta.—One hundred and fifty-six outbreaks of hog cholera occurred in Alberta in which 9,427 hogs, valued at \$77,743.20 were slaughtered in the undermentioned districts at a cost of \$51,828.80 in compensation.

One hundred and forty-four premises were also quarantined on suspicion, involving the control of 6,126 hogs.

Twenty-three hogs, valued at \$122.25, were destroyed for purposes of examination, but no evidence of hog cholera was found.

District.	No. of Outbreaks.	No. Destroyed.
Calgary	64	3,859
Edmonton	16	1,000
Macleod	5	169
Medicine Hat	45	3,219
Red Deer	12	517
Strathcona	5	356
Victoria	9	307
	156	9,427

British Columbia.—Seventy-eight outbreaks of hog cholera occurred in British Columbia in which 2,505 hogs, valued at \$21,396.60, were slaughtered in the undermentioned districts at a cost of \$14,264.40 in compensation.

Thirty-four premises were also quarantined on suspicion, involving the control of 1,062 hogs.

District.	No. of Outbreaks.	Hogs Destroyed.
Comox-Atlin	7	56
Kootenay	12	381
Nanaimo	9	164
New Westminster	12	892
Vancouver	1	53
Victoria	8	142
Yale-Cariboo	29	817
	78	2,505

DOURINE.

The very serious outbreak of dourine reported last year has occupied the attention of our staff in southern Alberta during the period covered by these figures and still continues to receive unceasing care. Every effort is made to limit its extent and to destroy every source of infection. It will be noted from the following statistics that progress has been made, and the situation is much more favourable than it was a year ago.

A total of 394 animals, valued at \$48,931, were slaughtered as being affected with this disease, at a cost of \$32,080.66, distributed as follows:—

	Suspected and Quarantined.	Slaughtered.
District— <i>Quebec.</i> Compton.....	4	2
District— <i>Saskatchewan.</i> Assiniboia..... Battleford..... Humboldt..... Moosejaw..... Prince Albert..... Regina..... Saltcoats.....	1 13 1 411 17 1 7	1 22 1
	451	24
District— <i>Alberta.</i> Calgary..... Edmonton..... Macleod..... Medicine Hat..... Red Deer..... Strathcona..... Victoria.....	10 13 56 873 178 3 6	1 159 184 24
	1,139	368

HORSE MANGE.

This disease continues to furnish work for our inspectors in various parts of the country, but the outbreaks have been small, isolated, and readily controlled except when the owners of the diseased animals are careless in carrying out the necessary treatment.

Province.	Outbreaks.	Animals Affected.	Animals Quarantined.
Quebec.....	6	9	12
Ontario.....			107
Manitoba.....	2	4	22
Saskatchewan.....	41	194	303
Alberta.....	3	5	26
	52	212	470

A total of 11,661 horses and 30 mules were inspected on being presented for shipment from the quarantined area in Alberta and Saskatchewan.

CATTLE MANGE.

Progress has been made in dealing with the disease, and it has been found possible to further reduce the area under special mange quarantine. This now comprises all that portion of the provinces of Saskatchewan and Alberta bounded by the international boundary, the Rocky mountains, and a line drawn from the Rocky mountains along the northern boundary of the Stoney Indian reserve to the line between ranges 5 and 6 west of the Fifth meridian, thence north along that line to the line between townships 34 and 35, thence east along that line to the line between ranges 10 and 11, thence south along the line between ranges 10 and 11 to the line between townships 25 and 26, thence east along that line to the line between ranges 3 and 4, thence south along that line to the line between townships 19 and 20, thence east along that line to the Fourth Principal meridian, thence south along the Fourth Principal meridian to the line between townships 16 and 17, thence east along that line to the line between ranges 17 and 18, thence south along that line to the line between townships 12 and 13, thence east along that line to the line between ranges 15 and 16, thence south along that line to the international boundary.

This substantial reduction in the area under restriction will benefit a large number of settlers and ranchers in the part now made free, by relieving them of the necessity of dipping their cattle, and allowing free movement of stock. Additional portions of the mange area will be released from time to time as the disease is brought under control, until it is possible to release it all. Co-operation of stock owners will hasten the time when this can be done with safety.

Province.	Outbreaks.	Animals Affected.	Animals Quarantined.
Ontario .....	.....	.....	5
Saskatchewan	5	13	3,679
Alberta ..	70	1,551	26,709
British Columbia .....	.....	.....	90
	78	1,564	30,483

Some 51,617 cattle were inspected on being presented for shipment from the quarantined area in Alberta and Saskatchewan, and 105,441 cattle were inspected in Winnipeg on arrival from points west thereof.

RABIES.

In control of this disease it was necessary to impose quarantine in limited areas of Ontario, Saskatchewan, and Quebec. The measures taken were successful in stamping out the disease. No fatalities in human beings were reported.

In Ontario, 56 premises were quarantined on account of the prevalence of rabies in the adjacent districts, distributed as follows:—

District.	Premises Quarantined.
Bruce	1
Huron	17
Perth	10
Toronto	13
Waterloo	1
Wellington	7
York	7
	56

In Saskatchewan, 2 premises were quarantined on account of the prevalence of rabies in the adjacent districts, distributed as follows:—

* District.	Premises Quarantined.
Qu'Appelle	1
Regina	1
	2

In British Columbia, 43 premises were quarantined on account of the prevalence of rabies in the adjacent districts, distributed as follows:—

District.	Premises Quarantined.
Nanaimo	29
Vancouver	13
Victoria	1
	43

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SHEEP SCAB.

Some few flocks of sheep in Manitoba were affected with this disease, which was eradicated by dipping the affected flocks and controlled by a period of quarantine. The origin of the infection was untraced.

In Quebec, 30 sheep were quarantined at LaBaie, being suspected of sheep scab.

In Manitoba, 270 animals on 20 premises were found to be affected with sheep scab, involving the control of 799 animals on 21 premises, distributed as follows:—

District.	Affected.	Quarantined.
Brandon.....	48	48
Dauphin.....	204	627
Macdonald.....	18	124

In accordance with the Quarantine Regulations, 16,196 sheep imported into Canada were quarantined for the prescribed period of thirty days.

TUBERCULOSIS.

This disease is widespread throughout the world, and no district or province of Canada has escaped infection. Owners of cattle are not often alarmed at its presence, as they would be if it occasioned sudden death. Its slow, insidious progress permits the farmer or dairyman to imagine that it is of little consequence. An occasional death in the herd is looked upon as inevitable, and the disease pursues its way unmolested. If cattle owners were alive to their own interests they would take steps to protect themselves against the constant drain of this disease by cleaning up their herds and keeping them clean.

This can be done, and the cost of it is not prohibitive. The Health of Animals Branch has many herds under its control in which the disease has been got rid of and kept out, and this work could be extended immensely if owners desired it. There is a standing offer that the Health of Animals Branch will assist any stock owner who wishes to establish a clean herd and is willing to conform to the simple agreement that is necessary to successful co-operation. The assistance of the branch provides for free testing of the herd whenever necessary, and in furnishing advice as to the best method of dealing with reactors, should any be found. The owner, on his part, is required to provide buildings of such a character that sanitation is practicable, and isolation of reactors possible when found necessary.

Although this offer has been available for several years, and one might expect hundreds of stock owners to have taken advantage of it, it is disappointing to state that there are at the present time less than fifty herds under this control.

The problem of dealing with bovine tuberculosis is not an easy one. Its very immensity deters the pioneer in legislation, who feels that the ordinary methods of dealing with contagious diseases would be of no avail against an infection so widely disseminated. Added to this is the knowledge that the average farmer is not asking

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to have the disease eradicated, and would probably resent any method of dealing with it that would cost him anything.

After much careful consideration of the whole subject, it was decided to attack the disease at the point where it is most dangerous to the human race. An attempt would be made to prevent the sale of tuberculous milk in cities and towns and to ensure that the milk supply should be derived solely from cows that had passed the tuberculin test. In order to secure the co-operation and goodwill of the citizens to this work it was decided to apply it only to such cities and towns as made a request for it and were already licensing dairies and keeping them up to a certain standard of cleanliness and sanitation. Provision was made for dealing with reactors in a liberal way, so as to minimize the loss to the owner as much as possible.

Adopting this plan, the following regulations were drafted and made law by Order in Council dated May 18, 1914:—

WHEREAS many cities and towns of Canada are endeavouring to ensure a pure and wholesome milk supply for their inhabitants, and especially to prevent the sale of milk from tuberculous cows;

AND WHEREAS it is deemed advisable and in the public interest for the Government to assist as far as possible this work;

THEREFORE the Governor General in Council is pleased to make and establish the following regulations relating to tuberculosis, and the same are hereby made and established accordingly:—

REGULATIONS RELATING TO TUBERCULOSIS.

1. The aid of the Department of Agriculture, as aforesaid, will be given to such cities or towns having a population of not less than five thousand persons as shall have secured the necessary provisions under provincial legislative authority for the purpose of agreeing to the present regulations.

2. The Government of Canada will assist any city or town which shall have signified in writing to the Veterinary Director General its desire to have the aid of the Department of Agriculture in controlling bovine tuberculosis in the cows supplying milk and cream to the said city or town, provided the said city or town shall have stated in its application for the aid of the Department of Agriculture, as aforesaid, that, being thereunto duly empowered by law, it will undertake and provide that:—

(a) Dairies in which milk or cream are produced for sale therein shall be licensed.

(b) No license shall be issued unless the dairy conforms to the required standard.

(c) The standard shall require that the stable shall have an ample amount of air space, and at least two square feet of window glass for each cow, and shall be well ventilated, drained, and kept clean and sanitary.

(d) After two years from the date of the first test of the cattle of any dairy, the sale within the said town or city, of milk or cream from any herd shall be prohibited unless the said herd shows a clean bill of health from the Veterinary Inspector.

(e) An inspector or inspectors shall be appointed and paid by the said city or town, whose duty it shall be to see that the undertakings and provisions, as aforesaid, are carried out, and that the cows are kept clean and properly fed and cared for.

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3. The Veterinary Director General, on receiving notice in writing from any such municipality of its desire to have the assistance of the Department of Agriculture, as aforesaid, shall forthwith make inquiry, and if satisfied that the foregoing requirements are being carried out, shall send Veterinary Inspectors to inspect the said cows.

4. Veterinary inspectors shall use the tuberculin test and also make a careful physical examination of the cows, in order to determine whether they are healthy or not. Dairy bulls shall also be examined and subsequently treated in the same way as cows.

5. Following the examination and test, the diseased cows and reactors shall be dealt with as follows:—

(a) Cows which in the opinion of the inspector are affected with open tuberculosis and are distributing the germs of the disease through the milk, faeces or sputum, shall be sent to an abattoir under inspection and there slaughtered as soon as conveniently can be done. When no such abattoir is within reasonable distance, the cows shall be slaughtered in the presence of the inspector, who shall direct how the carcasses shall be disposed of.

(b) Reactors to the test shall be separated from non-reactors as effectively as possible (suspicious animals shall be classed as reactors), and the owner shall be given the choice of disposing of them in one of the following ways:

(1) Immediate slaughter.

(2) Slaughter after they have been prepared for the block, by drying off and feeding.

(3) Retaining them in the herd, and selling no milk or cream until it has been pasteurized.

6. Compensation shall be paid to the owner of the herd for all cows slaughtered under these regulations, upon the following basis:—

(1) One-half the appraised value of the cow if destroyed as a case of open tuberculosis.

(2) One-third the appraised value of the cow if destroyed as a reactor at the request of the owner.

(3) Valuation shall be made by the inspector, and shall not exceed the maximum valuation for cattle as specified in section 6 of the Act.

7. The salvage from the carcass shall be paid to the owner of the cow in addition to the compensation, provided compensation and salvage together amount to less than the appraised value; if more, the surplus shall be paid to the Receiver General.

8. No compensation shall be paid to the owner unless, in the opinion of the Minister, he assists, as far as possible, in the eradication of the disease by following the instructions of the inspector as to disinfection, etc.

9. No milk or cream shall be sold from a herd containing reactors unless such milk and cream are properly pasteurized. The inspectors of the municipality shall see that this provision is effectively carried out.

10. Tests and examinations of the herds shall be made whenever deemed necessary by the Veterinary Director General, and after each test and examination the herd shall be dealt with in the manner aforesaid.

11. All cows bought by the owner of a herd, while under control, shall be submitted to the test and successfully pass it before being placed with the healthy cows.

12. When two successive tests fail to detect any reactors in a herd it shall be deemed healthy, and the Veterinary Inspector shall, when requested, give a certificate to that effect.

13. The existing regulations respecting tuberculosis, in so far as they may be inconsistent with the present regulations, are hereby repealed.

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By Orders in Council dated December 23, 1904, and November 30, 1909, in virtue of "The Animal Contagious Diseases Act, 1903" (R. S. C., 1906).

(1) The disease of tuberculosis is hereby exempted from the operation of sections 3, 4, 11, 36, 37, and 38 of the "Animal Contagious Diseases Act, 1903" (R. S. C., 1906).

(2) Cattle which have reacted to the tuberculin test shall be deemed to be affected with tuberculosis, and shall be permanently marked in such manner as the Veterinary Director General may from time to time prescribe.

(3) Cattle which have reacted to the tuberculin test shall not be permitted to be exported from the Dominion of Canada.

Many inquiries regarding these regulations immediately reached the department, and in some cases these were followed by formal applications for federal aid. Unfortunately, in most of these cases it was found on inquiry that the conditions required in paragraph 2 had not been complied with. Sometimes the dairies were not under license, unless selling directly to the consumer; those selling to milk companies not being licensed. Sometimes the sanitary conditions of the dairies were such that they could not be accepted as fulfilling the required conditions.

In consequence of these and other reasons, only one of the applications for federal aid was found to comply with the conditions, and in this city, Saskatoon, the testing of the dairy herds is about to begin, the spring of 1915, and the result of it will be reported in our next annual report.

A total of 166 cattle were tested on being imported into Canada, all of which proved healthy; 1,296 cattle were tested for export, 39 of which reacted, and 1,257 proved healthy; 2,641 cattle were tested, some for shipment to different provinces of the Dominion and others in herds under the supervision of this department, 184 of which reacted, 40 were classed as suspicious, and 2,417 proved healthy; 3,384 cattle were tested by private practitioners, 463 of which reacted, 105 were classed as suspicious and 2,816 proved healthy; all reactors were permanently earmarked by a veterinary inspector in cases where the owner did not voluntarily destroy them.

ANTHRAX.

Outbreaks of anthrax occurred in two provinces, and were controlled by the application of the Pasteur method of vaccination of all exposed animals. The vaccine was prepared at our laboratory.

The following outbreaks were reported and dealt with during the year:—

Province.	Outbreaks.	Animals Quarantined.
Quebec.....	18	471
Ontario.....	8	185
	26	656

Some 1,080 doses of anthrax vaccine and 81,739 doses of blackleg vaccine were sent out during the year.

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SCABIES IN FOXES.

On Prince Edward Island, 18 foxes were quarantined on 3 premises, being suspected of being affected with scabies.

ERGOTISM.

Inspector McKenzie, of Alberta, reports that on January 4 he visited the farm of W. P. Taylor, Carstairs, Alta., E. $\frac{1}{2}$ 5-30-27 W. 4, and found a herd of ninety head of cattle, twelve of which were suffering from ergotism. Necrosis of the inferior third of the tail, about one inch of the superior extremity of the ear, and both hind feet, was observed in one animal. In two others, both hind feet had sloughed off at the pastern joint; in another an indented ring circumscribing the hind leg about 6 inches above the fetlock joint, below which the tissue was gangrenous; in three, one claw was absent.

The other visibly affected animals exhibited swellings and lameness in one or both hind fetlocks.

The animals had access to stacks of rye straw since about November 1. Owner advises that first symptoms were observed on or about the 1st of September.

Inspector McKenzie advised the owner as to treatment of animals only slightly affected and to burn all rye stacks.

The same day he visited the farm of Knud Christiansen, 10 miles east of Carstairs, and found a herd of thirty-four cattle, six of which were showing the effect of ergotism, being lame, having enlarged fetlock joints, and lying down continuously.

The grain bins and rye stacks were examined, and a considerable quantity of ergot found. The animals had been feeding on rye straw for four weeks, and a slight lameness was first observed ten days ago.

Mr. Christiansen informed him that a neighbour, who had fed rye to pregnant sows, had twenty-eight abort. All rye straw was burned, and the owner instructed to thoroughly clean the rye grain before feeding.

LABORATORIES.

Satisfactory work has been done in all the laboratories of the branch. The biological laboratory, Ottawa, continues to furnish all the tuberculin, mallein, anthrax and blackleg vaccines required, besides doing a considerable amount of research work. The other laboratories, at Lethbridge and Agassiz, have been fully occupied with the special work they have in hand. Special reports of the officers in charge of these establishments will be found as appendices to this report.

QUARANTINES.

Much progress has been made in the work of equipping the new quarantine station at Levis. Residences have been erected for the foreman and two permanent employees. The office building has been completed. All of the buildings that were fit to move have been transferred from the old to the new grounds, and most of them

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have been erected. A well has been drilled, and pumping machinery installed, giving an ample supply of water to all the buildings, and also furnishing a system of fire protection. Progress has also been made in the clearing of loose stone from the paddocks, the erection of fences, and some necessary road-making. Much still remains to be done, but what has already been accomplished is sufficient to provide good accommodation for all the live stock likely to be imported during the present war. When the further equipment is completed, and other necessary improvements finished, we will have a quarantine station second to none.

The presence of foot-and-mouth disease in the United States, and the necessity for protecting our live stock from this highly infectious disease, led to the passing of an embargo upon live stock and its products, and of other commodities, such as hay and straw, which might carry the infection.

The regulations governing the embargo have been framed with the intention of giving the maximum protection to our live stock, with the minimum interference with trade. They have been modified from time to time as circumstances required, relaxing when danger no longer existed, and increasing their stringency when necessity arose. This has occasioned rather frequent changes, and our officers at the boundary have been called upon to enforce conditions which may sometimes have appeared unreasonable to importers. It is satisfactory to report that very little complaint has arisen.

At this date (March 31, 1915), the situation in the United States is still alarming. The infection is widely spread, and several boundary states are affected. We have hitherto escaped infection, and I trust may continue to do so, but until success has crowned the efforts of the Bureau of Animal Industry, and the disease is eradicated from the United States, we must continue our watchful vigilance.

The present situation has dangers peculiar to it that have not accompanied any of the other foot-and-mouth visitations in the United States. The necessity of furnishing the British Army with horses has forced us to permit American horses to traverse Canadian railways to Canadian ports of embarkation. While horses are not affected by foot-and-mouth disease, they may carry the infection upon their feet or hair, and thus communicate it to cattle, sheep, or swine. With this knowledge, care was taken to surround this traffic with every safeguard. Before loading the cars they were required to be cleansed and disinfected. Horses had to pass through a foot bath of disinfectant before reaching the car. No hay or straw was permitted to accompany the horses into Canada, and they were allowed to be unloaded only at designated yards. These were selected so that they could be isolated from all other live stock, and guards were placed to see that no horses were removed from the yards unlawfully, and no unauthorized persons allowed to enter.

Under these conditions the traffic has been going on without difficulty, and the danger reduced to a minimum.

SESSIONAL PAPER No. 15b

IMPORT TESTING.

IMPORT INSPECTIONS FROM UNITED STATES AND NEWFOUNDLAND.

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Asses.	Ele- phants.	Camels.
Charlottetown, P.E.I.....	5			2					
Halifax, N.S.....	147	1	1			2			
Sydney, N.S.....	64					3			
Yarmouth, N.S.....	8		3	6					
St. John, N.B.....	30								
St. Stephen, N.B.....	44		1						
McAdam Jct., N.B.....	14	1	6	4					
Debec Jct., N.B.....	19								
Woodstock, N.B.....	13								
Florenceville, N.B.....	1		1						
Aroostook Jct., N.B.....	94	2	3						
Grand Falls, N.B.....	8		1						
St. Leonards.....	5								
Edmundston, N.B.....	3		1						
N. B. General.....	10								
Quebec, Que.....	1								
Comins Mills, Que.....	15								
Lake Megantic, Que.....	64	4	5						
Beauceville, Que.....	58								
Coaticook, Que.....	11		1						
Beebe Jct., Que.....	74		2				1		
Sherbrooke, Que.....	31	1	1	1	3				
Highwater, Que.....	40	2	4						
Abercorn, Que.....	9		1						
St. Armand, Que.....	78	1							
Lacolle Jct., Que.....	64	5	5	140					
Noyan Jct., Que.....	26		1						
St. John's, Que.....	3								
Athelstan, Que.....	89	1	7						
Dundee, Que.....	56	2	152						
St. Agnes de Dundee, Que.....	34	1	1						
Cornwall, Ont.....	6		4						
Prescott, Ont.....	57								
Morrisburg, Ont.....	25								
Brockville, Ont.....	10		7						
Kingston, Ont.....	9		1						
Colborne, Ont.....	2								
Toronto, Ont.....	34	2							
Niagara Falls, Ont.....	564	7	34			1		11	5
Bridgman, Ont.....	2,106	24	27	1,056	4	5			5
Windsor, Ont.....	23,726	117	52	343	36	8	2		8
Sarnia, Ont.....	11,513	4	67	2,036		5			20
Sault Ste. Marie, Ont.....	89		9						
Port Arthur, Ont.....	2	1	3						
Rainy River, Ont.....	29		30		5				
Fort Frances, Ont.....	52	3	65			3			
Ontario General.....	4								
Emerson, Man.....	2,550	169	683	3,623	21	263		1	
Gretna, Man.....	638	19	99	7,698	2	1			
Snowflake, Man.....	41		9						
Bannerman, Man.....	147	5	20		11	2			
Manitoba General.....	2		8						
North Portal, Sask.....	2,729	124	1,976	141	10	2	2		
Northgate, Sask.....	72	4	10		2	1			
Wood Mountain, Sask.....	1,140	17	161	6,747					
Big Muddy, Sask.....	732	12	94						
Willow Creek, Sask.....	325	12	6	1,870					
Saskatchewan General.....	2								
Pinhorn, Alta.....	56	1		4,420					
Coutts, Alta.....	711	37	240	33,640	1		1		
Twin Lakes, Alta.....	205	2					2		
Alberta General.....	19	2							
Gateway, B.C.....	57								
Kingsgate, B.C.....	677	32	98	4		5			
Nelson, B.C.....	47	4	30	749		2			
Rykerts, B.C.....	6	1							
Rossland, B.C.....	18		71	46		1			

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IMPORT INSPECTIONS FROM UNITED STATES AND NEWFOUNDLAND. —Continued.

Port.	Horses.	Mules.	Cattle.	Sheep.	Swine.	Goats.	Asses.	Ele- phants.	Camels.
Grand Forks, B.C.	54	.....	8	128	.....	.....	.....	.....	.....
Midway, B.C.	21	.....	14	.....	.....	.....	.....	.....	.....
Myncaster, B.C.	1	.....	.....	.....	.....	.....	.....	.....	.....
Bridesville, B.C.	24	.....	12	.....	.....	.....	.....	.....	.....
Keremeos, B.C.	103	5	1	.....	.....	.....	.....	.....	.....
Osoyoos, B.C.	126	4	10	.....	.....	.....	.....	.....	.....
Huntingdon, B.C.	200	2	86	5,381	.....	4	1	.....	.....
New Westminster, B.C. ....	.....	.....	27	.....	.....	.....	.....	.....	.....
White Rock, B.C.	1,019	44	68	19,796	.....	25	4	.....	.....
Vancouver, B.C.	113	20	2	14,886	.....	101	.....	.....	.....
Victoria, B.C.	25	.....	17	2,222	1	.....	.....	.....	.....
White Horse, Y.T. . .	58	18	524	420	96	.....	.....	.....	.....
	51,844	722	4,889	105,228	187	438	16	15	38

¹ 12 deer. ² 1 llama. ³ 3 giraffes, 3 zebras. ⁴ 4 deer.

IMPORT INSPECTIONS FROM EUROPE AND ELSEWHERE.

Port.	Horses.	Mules.	Cattle.	Sheep.
Halifax, N.S.	1	.....	.....	.....
St. John, N.B.	21	.....	44	.....
Quebec, Que.	5	.....	.....	427
Montreal, Que.	216	1	.....	.....
Bridgeburg, Ont.	22	.....	.....	11
	265	1	44	438

SESSIONAL PAPER No. 15b

IMPORT TESTING.

Some 5,339 horses were tested on arrival from the United States and allowed to proceed to their destination.

Entered at—	Number.	Entered at—	Number.
Charlottetown, P.E.I.....	1	Windsor, Ont.....	85
Halifax, N.S.....	134	Sarnia, Ont.....	59
Yarmouth, N.S.....	2	Sault Ste. Marie, Ont.....	4
St. John, N.B.....	18	Port Arthur, Ont.....	3
St. Stephen, N.B.....	17	Rainy River, Ont.....	22
McAdam Jct., N.B.....	9	Fort Frances, Ont.....	38
Debec Jct., N.B.....	1	Ontario General.....	4
Woodstock, N.B.....	7	Emerson, Man.....	643
Florenceville, N.B.....	7	Gretna, Man.....	118
Arcostock Jct., N.B.....	26	Snowflake, Man.....	41
Grand Falls, N.B.....	8	Bannerman, Man.....	56
St. Leonards, N.B.....	5	Manitoba General.....	1
Edmundston, N.B.....	3	North Portal, Sask.....	619
New Brunswick General.....	2	Northgate, Sask.....	33
Comins Mills, Que.....	15	Wood Mountain, Sask.....	572
Lake Megantic, Que.....	65	Big Muddy, Sask.....	191
Beauceville, Que.....	58	Willow Creek, Sask.....	331
Coaticook, Que.....	9	Pinhorn, Alta.....	16
Beebe Jct., Que.....	67	Coutts, Alta.....	524
Sherbrooke, Que.....	11	Twin Lakes, Alta.....	158
Highwater, Que.....	14	Alberta General.....	8
Abercorn, Que.....	4	Gateway, B.C.....	25
St. Armand, Que.....	21	Kingsgate, B.C.....	148
Lacolle Jct., Que.....	14	Nelson, B.C.....	12
Noyan Jct., Que.....	9	Rykerts, B.C.....	10
St. Johns, Que.....	42	Rossland, B.C.....	18
Montreal, Que.....	1	Grand Forks, B.C.....	58
Athelstan, Que.....	13	Midway, B.C.....	21
Dundee, Que.....	7	Myncaster, B.C.....	1
St. Agnes de Dundee, Que.....	8	Bridesville, B.C.....	23
Prescott, Ont.....	12	Keremeos, B.C.....	76
Morrisburg, Ont.....	2	Osoyoos, B.C.....	126
Brockville, Ont.....	2	Huntingdon, B.C.....	65
Kingston, Ont.....	4	White Rock, B.C.....	21
Cobourg, Ont.....	2	Vancouver, B.C.....	6
Toronto, Ont.....	14	Victoria, B.C.....	13
Niagara Falls, Ont.....	315	White Horse, Y.T.....	43
Bridgeburg, Ont.....	204		

PURE BRED IMPORTS.

HORSES.

Breed.	Great Britain.	United States.	Elsewhere.	Total.
Belgian.....		5	8	13
Clydesdale.....	90	2		92
French Coach.....		1		1
Hackney.....	5	1		6
Hunter.....	5			5
Percheron.....		20	22	42
Pony.....	13			13
Shetland.....	109			109
Shire.....	3			3
Standardbred.....		42		42
Suffolk.....		1		1
Thoroughbred.....	4	7		11
Trottingbred.....		3		3
	229	82	30	341

CATTLE.

Breed.	Great Britain.	United States.	Total.
Aberdeen Angus.....		26	26
Ayrshire.....		1	1
Brown Swiss.....		1	1
Galloway.....		25	25
Hereford.....		121	121
Holstein.....		9	9
Jersey.....	94	32	126
Shorthorn.....		3	3
	94	218	312

SHEEP.

Breed.	Great Britain.	United States.	Total.
Cheviot.....		3	3
Cotswold.....	5		5
Dorset.....	73	1	74
Hampshire.....	288	5	293
Karakul.....		2	2
Lincoln.....	15		15
Oxford.....	2	11	13
Shropshire.....	28		28
Southdown.....	27		27
	438	22	460

SWINE.

Breed.	United States.
Chester White.....	10
Duroc Jersey.....	24
Poland China.....	4
	38

SESSIONAL PAPER No. 15b

DISEASED IMPORT.

Port.	No. Horses in Infected Shipments.	No. of Shipments.	No. of Horses Infected.	Origin.	Action.
St. John, N.B.....	13	1	1	U.S.....	Reactor destroyed.
Aroostook Junction.....	2	1	1	".....	Returned.
Gretna, Man.....	4	1	1	".....	"
Manitoba General.....	2	1	1	".....	"
North Portal, Sask.....	38	5	8	".....	"
Wood Mountain.....	29	5	5	".....	1 destroyed; remainder returned.
Big Muddy.....	7	3	4	".....	Returned.
Coutts, Alta.....	11	3	3	".....	"
Twin Lakes.....	16	1	1	".....	"
Alberta General.....	4	1	1	".....	"
Nelson, B. C.....	4	1	2	".....	"
Briderville.....	2	1	1	".....	"
Keremeos.....	27	4	5	".....	"
Osoyoos.....	18	2	4	".....	"
Victoria.....	5	1	1	".....	"
	185	31	39		

ANIMALS INSPECTED FOR EXPORT.

Port.	Horses.	Cattle.	Sheep.	Swine.
Charlottetown to Newfoundland.....	79	930	474	153
" to United States.....			1	
Summerside to Newfoundland.....		86	195	
" to United States.....				1
Halifax to Newfoundland.....	3			
" to Great Britain.....	11,896			
" to St. Pierre and Miquelon.....		16	8	18
" to Bermuda.....	7	19		26
" to Demarara.....			50	
Mulgrave to Newfoundland.....		67	24	
Sydney to.....	28	725		
" to St. Pierre.....	1	106		
St. John to Great Britain.....	9,327			
Toronto to United States.....		28,914	5,472	1,760
" to Bermuda.....		169		
	24,341	31,033	6,224	1,958

STAFF CHANGES.

APPOINTMENTS, RESIGNATIONS, ETC., MARCH 31, 1914, TO MARCH 31, 1915.

VETERINARY INSPECTORS.

Appointments.—A. A. Black, V.S., W. G. Gillam, V.S., H. S. Manhard, V.S., R. M. Nyblett, V.S., R. Roberts, F.R.C.V.S., G. S. Thornewill, V.S.
Resignations.—J. A. Black, V.S., J. J. Farrell, V.S., J. T. M. Hughes, M.R.C.V.S., R. W. MacDonald, V.S., A. M. McKay, V.S., C. R. Richards, V.S., G. S. Thornewill, V.S., J. H. Vigneau, M.V.

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INSPECTORS.

Appointments.—J. McNab, I. V. Law, H. H. Bulloch.

Resignations.—H. DeCock, W. McCullough.

CLERKS (OUTSIDE).

Appointment.—Miss E. Wilson.

Resignation.—Miss L. Cook.

Transfers.—Veterinary Inspectors: J. H. Shonyo, V.S. (from Meat Inspection), L. J. Demers, M.D.M.V. (from Meat Inspection).

Deaths.—Veterinary Inspector F. A. Jones, V.S.

OWING TO EXISTENCE OF FOOT-AND-MOUTH DISEASE IN THE UNITED STATES, FROM
MARCH 31, 1914, TO MARCH 31, 1915.

Appointments.—G. W. Robinson, A. E. Horne, A. A. Joslin, John Gillespie, John H. Quinsey, R. B. Storey, E. P. Branigan, John Morris, J. Robinson, Harcourt Acton, F. Davies, George Moore, R. Donnelly, J. Pridham.

No longer required and services dispensed with during period mentioned.—R. B. Storey, J. H. Quinsey, G. W. Robinson, F. Davies, R. Donnelly.

Transferred to Meat Inspection.—J. Pridham.

OFFICERS OF THE HEALTH OF ANIMALS BRANCH WHO LEFT FOR ACTIVE SERVICE DURING
THE PERIOD FROM AUGUST 4, 1914, TO MARCH 31, 1915.

INSIDE SERVICE.

C. H. L. Sharman, Chief Clerk; T. C. Evans, B.V.Sc., Assistant Pathologist.

OUTSIDE SERVICE.

Veterinary Inspectors.—E. C. Thurston, D.V.S., D. S. Tamblyn, D.V.S., B. R. Poole, V.S., Geo. S. Thornewill, V.S., J. T. M. Hughes, M.R.C.V.S., R. W. MacDonald, V.S., J. J. Farrell, V.S.

Range Riders.—G. Cousins, S. Metze, H. C. Evans.

Clerk.—G. H. Unwin.

OBITUARY.

It is with great regret that I record the death of F. A. Jones, V.S., of Windsor, Ont. Dr. Jones entered the service of this branch in 1903, and was placed in charge of the port of Windsor in 1905, which position he held continuously until his death on February 6, 1915.

MEAT AND CANNED FOODS DIVISION.

The growth and development of the packing industry in Canada has required a corresponding increase in the staff of inspectors entrusted with the enforcement of the Meat and Canned Foods Act and regulations. It has also been necessary to replace several of our inspectors who have volunteered for Army service. This has led to an unusual number of changes in our staff, and I am glad to report that the work of inspection has not suffered in any way.

SESSIONAL PAPER No. 15b

During the year, the municipal abattoir of Toronto has been placed in operation, and, at the request of the city council, is under our system of inspection.

This is the first municipal abattoir to be operated in Canada, and, in keeping with the size and importance of Toronto, is thoroughly modern in every respect. The equipment includes a modern cold storage plant, and also a rendering house, where offal and other waste products are converted into marketable commodities.

The operation of this abattoir is watched with much interest by other cities, and its success will probably be followed by the erection of municipal abattoirs in other places.

STAFF.

Chief, Meat and Canned Foods Division.—R. Barnes, V.S.

Travelling Inspectors, M. and C. F. Division.—H. H. Ross, V.S., M. J. Kellam, V.S.

In charge of Montreal.—F. H. S. Lowrey, V.S.

In charge of Toronto.—L. A. Willson, V.S.

In charge of Winnipeg.—C. D. McGilvray, M.D.V.

In charge of Prince Edward Island.—W. H. Pethick, V.S.

Chief Travelling Inspector, Fruit and Vegetable Canners.—C. S. McGillivray.

Canning Inspectors.—A. Bowlby, W. A. D. Graham, H. S. Switzer.

ADDITIONS TO STAFF.

Veterinary Inspectors.—F. R. Armstrong, B.V.Sc., Oluf Berntsen, V.S., *Chas. Brind, V.S., G. C. Cockerton, V.S., H. R. Estes, V.S., H. V. Fagin, V.S., C. W. Finne-
more, V.S., T. E. H. Fisher, V.S., E. E. Howe, V.S., W. B. R. Knowles, V.S., G.
A. Ledgerwood, V.S., F. Lefebvre, M.V., J. E. M. Lefebvre, M.V., J. G. MacDonald,
V.S., W. B. MacFadzean, V.S., G. M. Manning, V.S., C. A. Mitchell, V.S., G. A.
Nicholl, V.S., J. H. Part, V.S., G. G. Pook, V.S., Wm. Seymour, V.S., G. W. Star-
nahan, V.S., Jas. Steen, V.S., H. C. Storey, V.S., J. McL. Stuart, V.S., S. L. Wall, V.S.

Lay Inspectors.—A. Angrignon, A. Ardill, A. J. Champion, H. L. C. Christman,
T. F. Coleman, A. E. Harvey, A. E. Hawkins, R. F. Jackson, Geo. Jones, T. K. Kerr,
E. J. Laidlaw, Geo. Murton, J. W. Nickols, T. O. Paquette, Henri Pilon, Jas. Prid-
ham, A. E. Rutherford, S. R. Walkinshaw, W. H. Wheeler.

Canning Inspector.—H. G. Wilkinson (temporary).

TRANSFERS.

C. A. Mitchell, V.S. (to Laboratory), L. J. Demers, M.D., M.V. (to C. D. Division).

DEATHS.

S. B. Fuller, W. R. Monroe, V.S.

RESIGNATIONS.

F. W. Baumgartner, Oluf Berntsen, V.S., E. E. Howe, V.S., S. Jaques, B.V. Sc.,
G. M. Manning, V.S., W. A. Morrin, V.S.

DISMISSALS.

J. O. Guertin, M.V., J. McL. Stuart, V.S., F. A. Maccabee.

PROLONGED LEAVE OF ABSENCE.

On Active Service.—H. Colebourn, V.S., H. B. Collet, V.S., F. A. Daigneault,
M.V., K. L. Douglas, V.S., H. J. Elliott, M.D.V., C. W. Finne-
more, V.S., F. A. Walsh,
V.S., O. Brunet, M.V., A. C. Compton-Lundie, V.S., H. D. Nelson, B.V.Sc.

* Formerly a lay inspector.

ESTABLISHMENTS UNDER INSPECTION MARCH 31, 1915.

No.	Name.	Place.	Inspectors.
1	Armour & Co.....	Hamilton.....	A. C. Ramsay, V.S. J. G. Davidson, V.S. J. E. A. Duhamel, M.V. John Wright.
2B	Matthews-Blackwell, Ltd....	Brantford....	W. Kime, V.S. J. E. Bennett, V.S.
2C	" "	Peterborough.....	W. A. Henderson, V.S. Wm. Tennant, V.S.
10	F. W. Fearman Co., Ltd.....	Hamilton.....	C. J. Johannes, V.S. C. S. Cain, V.S. H. Garrett, B.V.S. Wm. Lawson, V.S.
11	Ingersoll Packing Co., Ltd	Ingersoll.....	R. D. Orr, V.S. A. G. Murray, V.S. W. J. Pedden, V.S.
13	Whyte Packing Co., Ltd... ..	Stratford.....	T. M. Pine, V.S. A. W. Beach, D.V.S.
16	Dominion Abattoir, Ltd.	London	W. R. Bell, V.S.
17	Jones Packing and Prov. Co.	Smiths Falls.....	J. B. White, V.S.
31	Chatham Packing Co., Ltd.....	Chatham.....	J. R. Thompson, V.S. A. A. H. Carley, V. S.
2E	Matthews-Blackwell, Ltd.	Toronto.....	F. Fisher, V.S. D. R. Bone, V.S. J. W. Fisher, V.S. A. Ardill. J. A. McCabe.
4A	Wm. Davies Co., Ltd.....	"	A. R. Torrie, V.S. J. H. George, V.S. J. E. M. Lefebvre, M.V. C. C. L. Wallace, V.S. J. R. Songhurst. Wm. Howard. P. J. Kelly. H. Newton.
5	Toronto Civic Abattoir.....	"	D. C. Tennent, V.S. F. A. McNally, V.S. A. C. Walker, B.V.S.
7	Harris Abattoir Co., Ltd.....	"	J. A. Hodgins. R. H. Cook, V.S. T. W. R. McFarlane, V.S. S. L. Wall, V.S. G. C. Cockerton, V.S. T. E. H. Fisher, V.S. A. C. Tanner, V.S. E. Cox. A. E. Harvey. C. L. Brittain. W. S. Blainey.
7A	" "	"	D. Brown.
9	Gunn's, Limited.....	"	E. R. Farewell, V.S. F. L. Wingate, V.S. W. J. MacFadzean, V.S. J. H. Mumford. E. Hunter. T. J. Kerr.
18C	Swift Canadian Co., Ltd.....	"	D. A. Irvine, V.S. J. E. Morse, V.S. T. H. Richards, V.S. A. A. Belanger, M.V. N. E. McEwen, B.V.Sc. C. S. Anderson, V.S. J. W. Nickols. J. T. Newton. E. E. White. P. Kingston.
28	W. Wight & Co.....	"	G. C. Brownridge, V.S.
2A	Matthews-Blackwell, Ltd	Hull, P. Q.....	Wm. Moynihan, B.V.S. J. Langevin, M.V. A. W. Younghusband, V.S. John Terrence.

SESSIONAL PAPER No. 15b

ESTABLISHMENTS UNDER INSPECTION MARCH 31, 1915.—*Continued.*

No.	Name.	Place.	Inspectors.
2D	Matthew-Blackwell, Ltd	Montreal.....	J. W. Symes, D.V.S. A. R. Douglas, V. S. J. N. L. Couture, M. V. G. W. Starnaman, V.S. T. O. Paquette. E. Lallemant.
4B	Wm. Davies Co., Ltd.....	"	C. H. Weaver, V.S. C. W. McIntosh, V.S. F. R. Armstrong, V.S. G. A. Ledgerwood, V.S. G. W. Walsh, Geo. Jones. H. Beaudoin. D. McDonald.
19A	Gordon, Ironside & Fares	Montreal	J. R. Young.
22	Montreal Union Abattoir	"	C. E. Dercme, M. V. W. H. James, V.S. R. D. Boast, V.S. E. C. Gauvin, M. V. J. Steen, V.S. A. J. Champion. Jas. Pridham.
24	Wm. Clark, Ltd.	"	E. G. Lemieux, M. V. A. Angrignon.
25	Montreal Abattoirs, Ltd.....	"	E. Dufresne, M. V. N. W. Reid, M. V. C. D. Bancroft, D. V. S. J. F. Campeau, M. V. R. Benoit. H. Pilon. A. E. Hawkins.
29	N. K. Fairbank Co., Ltd.	"	H. Mizener.
47	Société S. P. A.	"	H. Macey.
50	Davis & Fraser	Charlottetown	C. J. Bousefield, V.S.
18	Swift Canadian Co., Ltd.,	Winnipeg	J. D. Ross, V.S. F. C. Bishop, V.S. G. A. Nichol, V.S. H. R. Estes, V.S. J. G. McDonald, V.S. W. G. Williams. C. H. Johnston.
19	Gordon, Ironside & Fares, Ltd.....	"	F. C. Jones, V.S. R. B. Dellert, V.S. J. L. Trudeau, M. V. C. Brind, V.S. R. H. Lyon.
20	Gallagher, Holman & Lafrance.....	"	A. R. Walsh, V.S. H. Pomfret, V.S. T. F. Coleman.
21	Western Packing Co., Ltd.	"	J. R. N. Harrison, V.S. J. R. English, V.S.
19B	Gordon, Ironside & Fares	Moosejaw.	J. W. Purdy, V.S. S. G. Bright, V.S. J. A. Théoret, M. V. R. F. Jackson.
18B	Swift Canadian Co., Ltd.....	Edmonton.....	H. C. Leslie, V.S. R. G. Tupling, B. V. Sc. W. B. R. Knowles, V.S. F. Lefebvre, M. V. G. G. Pook, V.S. E. J. Laidlaw. H. L. C. Christman. W. H. Wheeler.
23A	P. Burns & Co., Ltd.....	"	I. Christian, V.S. H. V. Fagin, V.S. L. H. Swail, V.S. L. R. Walkinshaw.

ESTABLISHMENTS UNDER INSPECTION MARCH 31, 1915.—*Concluded.*

No.	Name.	Place.	Inspectors.
27	Gainers, Limited.....	South Edmonton.....	Geo. Whitehead, B.V.Sc. J. H. Part, V.S.
23	P. Burns & Co., Ltd.	Calgary.....	J. A. McLeish, V.S. H. C. Storey, V.S. Wm. Seymour, V.S. D. E. Tulloch, M.R.C.V.S. T. J. McLelland. Geo. Murton. C. E. Smith.
23B	P. Burns & Co., Ltd.....	Vancouver.....	E. A. Bruce, V.S. J. Dickinson, V.S. J. G. Jervis, B.V.Sc. H. W. Mallett. A. E. Rutherford.

ESTABLISHMENTS temporarily under inspection during the year ending March 31, 1915.

No.	Name.	Place.
12	Prince Edward Island Railway.....	Kensington, P.E.I.
15	John Rcop.....	Charlottetown, P.E.I.
33	Belkin, Lukatsky & Jamieson.....	Calgary, Alberta.
34	Sussex Packing Co.....	Sussex, N.B.
35	New Brunswick Cold Storage.....	St. John, N.B.
36	W. A. Leard.....	Charlottetown, P.E.I.
36B	W. A. Leard.....	Summerside, P.E.I.
37	Railway Freight Shed.....	York, P.E.I.
38	Railway Freight Shed	Cape Traverse, P.E.I.
40	Aylmer Canning Co.....	Aylmer, Ontario.
41	Prince Edward Island Railway	Bradalbane, P.E.I.
43	Steam Navigation Co.	Charlottetown, P.E.I.
51	J. H. Myrick & Co.....	Tignish, P.E.I.
54	Halifax Cold Storage	Halifax, N.S.
57	P. MacNutt & Son.....	Malpeque, P.E.I.
61	W. S. Fraser.....	Murray River, P.E.I.
64	P. C. Gallant.....	Summerside, P.E.I.
65	Thomas Butler.....	Murray River, P.E.I.
66	John Munn.....	Murray River, P.E.I.

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DISEASES FOUND AT ESTABLISHMENTS UNDER INSPECTION.

Diseases.	Cattle.			Sheep.			Swine.			Poultry.
	Car- casses.	Por- tions.	Lb.	Car- casses.	Por- tions.	Lb.	Car- casses.	Por- tions.	Lb.	Lb.
Abscess.....	10	23,926		11	367		7	2,739		
Actinomycosis.....	51	17,439			7			1,153		
Adhesions.....		9,990			848			8,729		
Arthritis.....	1						3	5		
Angiomatosis.....		2,508								
Anemia.....	2									
Bruises.....	147	39,566	67,034	42	630	105	58	18,791	74,052	
Carcinoma.....							1			
Cripples.....	43	270		1	37		13	7,546		
Cysts.....		39			3		3	451		
Cystitis.....	1						2			
Cysticercus Bovis.....	150	1,185								
" Cellulosæ.....							478	95		
" Ovis.....					123					
" Teniuollis.....				1	99			6		
Congestion.....	1	30			136		3	2,078		
Cirrhosis.....		10			1			5,047		
Contamination.....			10,833					8	1,321	
Decomposed.....			96,103			5,449			136,374	
Dirty.....		15	423,031		3	1,678		608	48,199	
Emaciation.....	145			75			112			
Enteritis.....	2			1			91			
Emphysema.....	3	1		1			8	978		
Frozen.....								7		
Gangrene.....	4						4			
Hernia.....				2	9		1	53		
Hydraemia.....	17	2		8						
Hydremic cachexia.....				1						
Hypertrophy.....		2						30		
Hog cholera.....							1,034			
Immaturity.....	3,354									
Improper bleeding.....	187			47			131			
Inflammation.....	28			3			33			
Icterus.....	3			12			34			
Induration.....		56						99		
Johne's disease.....	3									
Moribund.....	11			2			13			
Metritis.....	16			7			23			
Mucoid degeneration.....	64									
Mammitis.....	1							27		
Melanosis.....	1	4					1	1		
Mouldy.....			3,301							
Necrosis.....	1	222			494		2	21,772		
Nephritis.....	8						13			
Parturition.....				1						
Pregnancy.....							6			
Parasitis.....		34,758		1	94,429		6	97,566		
Pericarditis.....	61			2			10			
Peritonitis.....	43			13			107			
Pleuritis.....	10			8			70			
Pneumonia.....	90			95			300			
Pyaemia or septicaemia.....	151			40			686			
Sexual smell.....							81	332		
Skin disease.....							3	975		
Scalded alive.....							5			
Sepsis.....							6			
Sarcoma.....	4						4			
Sapremia.....	3						21			
Sour.....	6	10	84,286			98		5	110,243	
Stale.....							8			
Septic infection.....	139						6			
Tuberculosis.....	3,219	20,590		2	1		3,977	723,117		
Tuberculosis pseudo.....				44	61					
Tumours.....	18	19			1		4	9		
Uraemia.....							14			
Various.....	20	15,314	754	2	171		42	226	1,768	2,227
Damaged by fire.....		3,123	75				7	11	19,562	
Total.....	8,018	169,079	685,467	422	97,418	7,330	7,481	892,465	191,519	2,227
Found dead.....	215			294			1,946			and 388 car- casses.

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The following summary shows the results of post mortem inspections of cattle, sheep and swine from April 1, 1914, to March 31, 1915:—

Cattle marked "Canada Approved"	522,407
Carcasses of cattle "Condemned"	8,018
Percentage of cattle "Condemned"	1.51
Portions of cattle "Condemned"	169,079
Sheep marked "Canada Approved"	446,751
Carcasses of sheep "Condemned"	422
Percentage of sheep "Condemned" .. .. .	.09
Portions of sheep "Condemned"	97,418
Swine marked "Canada Approved"	2,590,857
Carcasses of swine "Condemned"	7,481
Percentage of swine "Condemned" .. .. .	.28
Portions of swine "Condemned"	892,465
Total number of carcasses "Passed"	3,560,015
Total number of carcasses "Condemned"	15,921
Percentage of carcasses "Condemned" .. .. .	.44
Total number of portions "Condemned"	1,158,962

In addition to the animals slaughtered at inspected establishments, the following amounts of dressed and cured meats and lard, etc., were received during the fiscal year from the United States and Australasia:—

Beef	lbs.	866,225
Mutton	"	472,265
Pork	"	11,707,567
Lard	"	56,831

During the course of re-inspection, the following meats were condemned:—

	Cattle.	Sheep.	Swine.	Poultry.
	lb	lb.	lb.	lb.
Bruised	67,034	105	74,052	.. .. .
Contaminated	10,833	.. .. .	1,321	.. .. .
Decomposed	96,103	5,449	136,374	.. .. .
Dirty	423,081	1,678	48,199	.. .. .
Mouldy	3,301	.. .. .	.. .. .	.. .. .
Sour	84,286	98	110,243	.. .. .
Damaged by fire	75	.. .. .	19,562	.. .. .
Various	754	.. .. .	1,768	2,227
Total	685,467	7,330	391,519	2,227

Total amount condemned on re-inspection, 1,086,543 pounds.

Customs statistics show that we imported and exported the following:—

	Imports.	Exports.
Cattle (live)	1,683	185,924
Sheep "	110,663	43,292
Swine " .. .. .	.. .. .	243,312
Beef	1,783,936	29,744,832
Mutton	3,451,812	1,064,963
Pork	10,611,591	116,179,362
Lard	703,882	2,692,734
Canned meats, etc.	1,857,168	4,434,902

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CAR AND YARD INSPECTION.

The enforcement of the special regulations for our protection against foot-and-mouth disease has thrown extra work upon the inspectors, and it has been necessary to add to their numbers. The work has been carefully and efficiently performed and has, in my opinion, contributed not a little to our protection from disease.

It has been found that the disinfectants offered for sale for such purposes as the disinfection of cars and yards vary greatly in strength. A preliminary investigation shows that some of them have very little value. We have therefore undertaken to test a number of commercial disinfectants, and will insist upon the use of such only as are proved to have sufficient strength.

TENTH INTERNATIONAL VETERINARY CONGRESS.

This report would be incomplete without some reference to the International Veterinary Congress, which I had the honour to attend as delegate from Canada.

First organized in 1863, through the efforts of a British veterinarian, Professor Gamgee, the initial meeting was held in Hamburg and attended by one hundred and two members. Every five years since that time the congress has met in various cities of Europe, including Vienna, Zurich, Brussels, Paris, Bern, Baden Baden, Budapest, and The Hague. For the tenth meeting the city of London was selected as an appropriate recognition of the fact that the originator of these congresses was an Englishman.

Originally founded with the object of arranging for concerted action against rinderpest and contagious pleuro-pneumonia, which at that time were causing immense losses in Europe, the work of subsequent congresses has been of much greater scope, and concerns all contagious diseases of animals and the best way of dealing with each in the interest of the country affected.

Sir John M'Fadyean, Principal of the Royal Veterinary College, London, and President of the Tenth Congress, says in his opening address:—

“With regard to the success of the congresses in promoting the objects for which they were founded, there can be no difference of opinion. Their primary purpose is to bring fresh views and supposed new discoveries in any department of veterinary science to the crucial test of criticism by the highest experts. Thus they serve to correct errors and to diffuse knowledge among the members themselves. It would be a mistake, however, to represent these congresses as existing solely for the purpose of eliminating error and extending knowledge among the members of the veterinary profession. The proverb that prevention is better than cure applies as forcibly to animal as to human diseases, and a glance at the programmes of past congresses shows how fully that has been realized by the members of the veterinary profession, since the great bulk of the papers and discussions have been concerned with the prevention of contagious diseases among the domesticated animals. But prevention nearly always requires concerted action enforced by legislation, which, in turn, must have the intelligent support of the people interested if it is to be effectual. One of the purposes

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of the congress must, therefore, be to spread to the widest possible extent among the interested laity a knowledge of the fundamental facts regarding the causes of preventable diseases. There is no need to be dissatisfied with the work of past congresses in this respect, for to their influence one can trace many of the laws which during the last fifty years have been passed with a view to exterminating or holding in check the epizootic diseases of animals, including those which are communicable to human beings. It would, unfortunately, be easy to show that incalculable sums of money would have been saved by some countries had their governments paid earlier heed to the resolutions passed at some of these congresses."

The congress convened at Central Hall, Westminster, on Monday, August 3, a large number of delegates and their wives being present. The opening address was to have been delivered by the Rt. Hon. Walter Runciman, President of the Board of Agriculture and Fisheries, but, as he was unavoidably absent, the meeting was opened by Sir John M'Fadyean, who was elected president by acclamation, and addressed the meeting briefly, referring to the regret of the members in the absence of Mr. Runciman, and outlining the work of the congress.

Some routine business being transacted, an invitation was extended to representatives of foreign governments to say something to the meeting, the first to rise being Professor Dégive of the State Veterinary School, Brussels. Professor Bang, Veterinary School, Copenhagen, followed, succeeded by representatives from Brazil, Holland, Japan, Chili, Norway, Russia, Portugal, Argentine Republic, Roumania, Cuba, Italy, Sweden, Egypt and the United States. This list of countries is an indication of the worldwide influence of the congress, which had a list of 1,500 members.

The congress reassembled next morning, August 4, at 11 a.m. It was very evident from the small number of delegates present that little interest could be taken in the proceedings while the question of peace or war for England was in the balance. The opening words of the president voiced the sentiment of the meeting. A brief discussion followed, in which it was pointed out that there were no delegates present from any of the Central States of Europe, that members were rapidly leaving the congress, and that with such a diminished and diminishing attendance, the congress was no longer international. The logical conclusion followed,—to adjourn the congress indefinitely, in the hope that when peace returned it would be possible to resume its meeting. After transacting the necessary business to ensure the existence of the congress as an organization, the president declared the congress closed.

While regretting this sudden end of the congress, I cannot say that my visit to England was without benefit. I took the opportunity, while awaiting the date of my departure for home, of seeing Sir John M'Fadyean and Sir Stewart Stockman and learning of their investigations into various matters of interest to the veterinarian, as, for instance, contagious abortion of cattle, swine fever, etc. I visited the laboratory of the Board of Agriculture at Alperton on several occasions, and am under obligation to Sir Stewart Stockman and his assistants for their courtesy in showing me everything I desired to see. I also visited Professor Nuttall, at Cambridge, with whom our Dr. Hadwen has done some useful work. Professor Nuttall was extremely cordial, and gave me much useful information on ticks as disease carriers. I was also able,

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while in London, to adjust some matters in connection with the export of live animals to Canada, so as to shorten the time necessary for a shipper to obtain a certificate of health.

In conclusion, I desire to express my thanks to the staff of the Health of Animals Branch for the loyal support they have given me in endeavouring to perform their duties promptly, efficiently, and tactfully, so as to avoid unnecessary friction with the public, and in particular I wish to thank Drs. Hilton and Barnes of the headquarters staff for their careful and untiring work.

I have the honour to be, sir,

Your obedient servant,

F. TORRANCE,

Veterinary Director General.

APPENDIX No. 1.

(*G. Hilton, V.S., Chief Veterinary Inspector.*)

OTTAWA, March 31, 1915.

SIR,—I have the honour to report that during the year ending March 31, 1915, I have been constantly engaged in an executive capacity at headquarters.

The period in question has been marked by unusual activity. In view of the necessity of enforcing special restrictive measures for the protection of our live stock interests against the possible introduction of foot-and-mouth infection, there has been a constant stream of correspondence.

Several of the staff are either on active service or are absent undergoing military training, preparatory to proceeding overseas. As substitutes have not been provided in every case, it has been necessary to utilize the services of every available member of the Branch to the best possible advantage. This has necessitated the frequent rearrangement of the work of the staff, and as much of this work is of an exacting nature, some difficulty has been experienced. The members of the staff engaged in this particular work accepted the situation and deserve great credit for their untiring energy and close application to their work.

I have the honour to be, sir,

Your obedient servant,

GEORGE HILTON,

Chief Veterinary Inspector.

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APPENDIX No. 2.

(R. Barnes, V.S., Chief, Meat Inspection Division.)

OTTAWA, March 31, 1915.

SIR,—I have the honour to submit my annual report for the year ending March 31, 1915.

The period covered by the past twelve months has been one of the most important, as regards the number of animals slaughtered under inspection, since the inauguration of the work in 1907.

The very large increase in the number of hogs killed was due entirely to extra production in the western provinces. This surplus over previous years was well taken off by Canadian packers and by export to the United States. Prices, however, remained firm owing to the increased demand from Great Britain and the conditions produced by the war, which interfered to a considerable extent with the usual supply from Denmark and Holland. These factors, combined with the increased home markets which resulted from the establishment of mobilization centres for our Canadian troops, provided a steady outlet for our surplus hog products. Packers were therefore on the alert to increase their trade, and bought liberally, with the result that the prices paid to the producers were such as would undoubtedly prove remunerative. When the increasing freight rates, insurance, exchange rate, and difficulty in securing transportation are considered, the whole trade may be said to be in a very satisfactory condition with a reasonably fair prospect of remaining so for some time.

Unfortunately, a section of the Prairie Provinces, owing to drought, was unable to produce sufficient grain to continue the feeding of the live stock, with the result that during the early fall hundreds of hogs were rushed to the market in an unfinished condition. The marketing of such animals has a strong tendency to cause a general lowering of price and to imperil the high standard of Canadian bacon. This run was, however, of short duration, and any change which it may have produced in the market was soon overcome.

It is hoped that the enlarged production of live animals in the west will continue, as the facilities for disposing satisfactorily of the products at the present time and for some time to come are practically assured.

The total number of cattle killed shows a decrease when compared with previous years, yet Canadian packers secured and filled for the Allies some large orders of canned and frozen beef.

The number of sheep killed shows a decrease, which is no doubt due to the outbreak of foot-and-mouth disease in the United States, in consequence of which a prohibitory order was issued against the importation of live animals from that country.

It has been the custom in the past to import large numbers of these animals for immediate slaughter and consumption. It is hard to understand why stock-raisers in Canada do not give this branch of the industry more serious consideration as the number of sheep is, in proportion to area and population, much smaller than in other countries which cannot be considered as being any more favourably adapted for production and marketing.

Regarding the total slaughter the following statistics are submitted:—

Cattle,	530,425 head ; decrease under 1913-1914.....	1,569 or .29 per cent.
Sheep,	447,173 " " " "	52,111 or 10.44 "
Swine,	2,598,338 " increase over "	799,278, or 41.42 "

The provinces show increases or decreases as follows:—

Province.	Cattle.		Sheep.		Swine.	
	Head.	%	Head.	%	Head.	%
Ontario	+10,863	5.41	- 4,956	3.30	+446,714	50.05
Quebec	+14,492	7.16	- 5,821	3.84	+ 69,088	21.54
Manitoba	-18,056	31.80	-10,858,	20.66	+ 99,811	47.75
Saskatchewan ..	- 4,157	74.62	- 4,988	49.86	+ 38,220	96.50
Alberta.....	- 886	2.20	-21,718	32.86	+149,043	61.40
British Columbia.....	- 4,003	16.24	- 8,676	18.12	- 8,257	10.74
New Brunswick ..	+ 41	341.66	+ 5,465	9.01	.....	.....
Nova Scotia ..	.....	.....	- 347	18.58	.....	.....
Prince Edward Island ..	+ 137	6.64	- 212	1.60	+ 4,659	26.28

The percentage of slaughter for each province to the total for all Canada:—

Province.	Cattle.	Sheep.	Swine.
	Per cent.	Per cent.	Per cent.
Ontario.....	39.86	32.47	51.54
Quebec	40.85	32.56	15.00
Manitoba . .	7.30	9.32	11.87
Saskatchewan ..	26	1.12	3.00
Alberta	7.39	9.92	15.08
British Columbia.....	3.89	8.77	2.64
Maritime Province.....	41	5.83	86

These percentages show very little difference from last year.

The increases in killings for Eastern and Western Canada over 1913-14 were as follows:—

Eastern Canada..	42.28 per cent.
Western Canada..	49.00 " ..

While 1913-14 showed Eastern Canada to have a decrease of 10 per cent and Western Canada an increase of 146 per cent against 1912-13.

The increase in carcasses condemned is almost altogether made up of tubercular cattle condemned, the increase in carcasses condemned being 11.71 per cent over last year, and in portions 41 per cent.

The number of sheep carcasses condemned is about 5 per cent over the number condemned last year, whereas the sheep slaughtered number about 52,000 less than a year ago. The sheep portions condemned call for no comment. A considerable amount of *Cysticercus ovis* has been found in sheep in Western Canada, which are, in most cases, I believe, of American origin.

While the number of carcasses and portions of swine condemned is higher than last year, the percentage on the killing is about the same.

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I must again call attention to the large number of carcasses condemned for improper bleeding and bruises, caused by rough handling and the overloading of stock cars. The number of portions and pounds condemned for bruises is very much higher than in previous years.

The amount of hog cholera this year is very high compared with that for 1914, the carcasses condemned for this cause being about four times as many as last year.

The increase in hog killings in Ontario and Quebec must not all be attributed to increased production in these provinces, but is mostly made up of western hogs brought from Manitoba and Alberta, where the extra production has enabled them to keep up their high killing percentage and also to export large numbers to Eastern Canada and the United States, the latter amounting to over 240,000 head.

A large number of frozen dressed hogs have also been shipped to Great Britain and the United States during the winter months.

A large trade in dressed beef has developed with Great Britain, and large orders have also been received for canned beef for Army purposes.

The annual examinations were held throughout Canada on April 21, 1914, at which sixty-eight candidates presented themselves. Of this number, forty-five were successful and nineteen were appointed as officers of the branch.

On May 20, a special examination was held for the graduates of Laval University, nine of whom wrote, but only one of whom obtained the required number of marks, and was appointed.

The work of the different inspectors has been, on the whole, satisfactory. In the carrying out of such a measure as the Meat and Canned Foods Act many contentious matters are continually coming up. Our inspectors in charge of the different establishments have handled these problems in a very satisfactory manner, which is creditable both to themselves and the service to which they belong, and in adjusting these differences the managements of establishments under inspection have shown a splendid spirit of co-operation which is much appreciated.

The health of the staff has been fairly good considering the nature of their work. The constant handling of diseased conditions in the steam, draughts, and unnecessarily damp and wet slaughter floors, the examination of meats in chill rooms and freezers, and the supervision of shipments from outside platforms (all of which must be attended to) cannot be looked upon as a sinecure nor as particularly conducive to continuous robust health.

The work of Travelling Inspector Ross has been of the same high standard as in the past, yet it was found that, in order to properly supervise the work and bring it into a closer uniformity, the territory covered by him was too great to obtain the degree of efficiency aimed at. It was therefore decided to make a division, and M. J. Kellam, V.S., was detailed for duty as a travelling inspector, with headquarters at Calgary. His field extends from Winnipeg to the Pacific coast. This division of the work has been fully justified by the results obtained, as Dr. Ross has all the work that he can properly do in Eastern Canada.

The circulars issued from time to time with information regarding the manner in which the work should be carried on, as well as interpretations of the requirements of the Act and Regulations, are proving of value to the managements of establishments and to our officers, and have no doubt cleared up many points which would have tended to cause friction.

At the outbreak of the war in Europe, patriotism and willingness to serve the Empire were not confined to individuals outside our service. Requests for permission to enlist were received from so many of our officers that it was necessary to give the matter serious consideration. While the loyalty of the applicants for leave was appreciated, it should not be forgotten that the work carried on under the Meat and Canned Foods Act was one which had an important bearing on the health of those

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who depend upon meat as a portion of their food. As this product forms a staple in the feeding of our soldiers as well as of civilians, it is essential that it be rigidly inspected to ensure its freedom from disease, more particularly at the present time when those who are defending our Empire are subjected to the hardships and trying conditions of warfare which in themselves are sufficient to affect the most robust constitution. This inspection can only be carried on by trained and experienced men. The urgency of the call for veterinarians, however, and the willingness of those who remained to carry on the work of those who wished to go to the front, were the deciding factors in granting leave of absence to eight of our veterinary inspectors.

During the year the first municipal abattoir in Canada was opened for business in the city of Toronto. This is a splendidly built and equipped plant, and it is hoped that it will be liberally patronized in order that it may prove a success financially. It is unnecessary to point out the need of similar establishments in other cities and towns, as this is well known and recognized. It is unfortunate that municipalities have not the power to control the meat supply by providing facilities for adequate inspection and sanitary slaughtering of animals intended for local consumption.

CANNED FRUITS, VEGETABLES, AND MILK.

In October I visited, with Inspector McGillivray, some of the canning factories in western Ontario, and was pleased to note the general improvement in sanitary conditions at such plants as were in actual operation at the time of my visit. I noted the care taken in examining the raw materials as they entered the plant, and the splendid supervision exercised by the management during the whole process of manufacture.

It appears to me that if the manufacturers of canned fruits and vegetables adopted a set of standards of quality for their products it would increase the consumption of such foods, as at the present time the purchaser has no reasonable assurance as to the contents of the can, either from the description on the label or the name of the brand under which it is sold.

Marked progress has been made in improving the quality of the evaporated apples offered for sale. Hundreds of samples were taken by our inspectors and forwarded to Dr. Shutt, Dominion Chemist, for analysis as to moisture. In cases where the sample showed a moisture content greater than that allowed by law, viz., 27 per cent, the product was held and owners were compelled to re-dry it until the moisture was within the legal limit, when it was released and permitted to be sold. While this procedure was the cause of inconvenience and delay to the packers, very little complaint was made, as it is an indisputable fact that the unsatisfactory condition of this industry in the past was due almost entirely to excessive moisture in the finished product. The work of preparing a bulletin on this product is progressing satisfactorily under the direction of Mr. McGillivray, and it is hoped that it will be ready for publication during the coming year.

The sanitary conditions surrounding the manufacture of condensed and evaporated milk have been very satisfactory, and the usual high standard of quality has been well maintained.

In conclusion, I desire to express my appreciation of the loyalty and co-operation of the members of the staff and of the managements of the establishments coming within the operation of the Act. Without such support the progress made could not have been accomplished.

I have the honour to be, sir,

Your obedient servant,

ROBT. BARNES,
Chief, Meat and Canned Foods Division.

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APPENDIX No. 3.

(A. E. Moore, D.V.S., Chief Travelling Inspector.)

OTTAWA, March 31, 1915.

SIR,—I have the honour to submit herewith my annual report for the year ending March 31, 1915.

A large portion of my time this year has been devoted to controlling several very serious outbreaks of hog cholera, especially in the old hog cholera centres of the counties of Essex and Kent in the province of Ontario.

As in former years, I have visited and consulted with the field inspectors and instructed them in their various duties pertaining to this branch.

GLANDERS.

I am pleased to report again this year that I have not seen a case of glanders in Eastern Canada. This is indeed very encouraging, as many years of very hard and disagreeable work was necessary in order to control this disease. It is, therefore, very satisfactory to realize that our labours have not been in vain, and have proved of great benefit to the different communities where the disease was prevalent.

TUBERCULOSIS.

Supervised herds.—I have tested 228 cattle in herds under the supervision of this branch; 34 of these reacted, and 9 were suspicious.

Testing for export to the United States.—During the year I tested 19 cattle for export to the United States, none reacted; these were on four different farms.

HOG CHOLERA.

In April and May I was called to Montreal and found, on investigation, several outbreaks of hog cholera among the garbage-fed hogs near that city. Assisted by Inspector Demers we located all those feeding garbage, and immediately destroyed all their diseased and contact hogs. We also placed in quarantine all the other premises where garbage was fed. The infection was confined to four places, and fortunately did not spread to the adjoining farms.

Repeated visits have since been made among the garbage feeders near Montreal, and so far no further evidence of the disease has appeared.

In July one small lot of hogs became infected by garbage near the town of St. Johns, Que. These were properly disposed of and the infection promptly checked.

During the fall and early part of the winter there were, unfortunately, three extensive outbreaks of hog cholera in the counties of Essex and Kent, Ontario. I was constantly engaged for three months in supervising the control of these outbreaks.

The disease first started at Chatham, Kent county, about the middle of August, on two premises where garbage was fed. From these two centres the disease gradually spread until it was necessary to destroy hogs on about 200 premises in and around Chatham. The outbreak extended, among the farmers' hogs, from the city of Chatham well into the townships of Chatham, Dover, Raleigh, and Harwich.

The second outbreak started in the town of Kingsville, Essex county, on October 1 among a lot of garbage-fed hogs. The hogs had been affected for some weeks before it was reported, and the infection was badly spread before the inspector's arrival.

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About two weeks after, other hogs in the district became infected and the disease spread rapidly from this time on (among the farmers' hogs) until it reached Harrow on the west, Cottam on the north, and Ruthven on the east. The infection particularly followed the Lake Shore road, and involved nearly every farm as far as Harrow.

In the third outbreak, the first case was discovered on October 6 on a farm at Amherstburg, Essex county. The origin of this outbreak was traced from hogs belonging to a fish company.

It was found that this company had been losing hogs for some time. It is thought that they contracted the disease by coming in contact with infected carcasses of hogs which were washed ashore at the fish company's farm, which is situated on lake Erie. This outbreak spread east as far as Harrow, principally along the Lake Shore road, but it got well back into the concessions before it was checked.

It is the practice in the fall of the year for the farmers in these corn-growing districts to allow their hogs to run in the corn fields; in fact, they usually have the run of the whole farm. If hog cholera is present on one farm this practice exposes a large number of hogs to the infection. Birds, especially pigeons and crows, which are very numerous in this district, feed on the droppings of the hogs, which contain small particles of undigested corn and are, therefore, a serious means of carrying the infection from place to place. Owing to the above conditions it is always extremely difficult to control outbreaks of hog cholera.

It was repeatedly demonstrated to us that hogs which were closely confined often escaped the infection. Special means were taken to have all hogs in the infected districts closely housed as quickly as possible. This was extremely difficult to enforce, but we persisted in it, and I am satisfied that it was this precaution that enabled us to finally control the outbreaks.

In January and February hog cholera broke out among the garbage-fed hogs at Ottawa and Kingston, but the disease was checked before the infection spread into the country.

You will observe that the origin of practically all the outbreaks of hog cholera this year has been the feeding of infected garbage.

VARIOUS.

On September 15 I visited Mount Laurier, Que., to inspect horses which were being treated by Dr. James. I found the disease to be pernicious anæmia. Several horses had died and others showed typical symptoms of the disease. By all accounts this malady has been in that district for some years.

Several reports of suspected anthrax were investigated but proved to be black-quarter or *hæmorrhagic septicæmia*. No actual cases of anthrax were seen.

I have the honour to be, sir,

Your obedient servant,

A. E. MOORE,
Chief Travelling Inspector.

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APPENDIX No. 4.

QUEBEC, March 31, 1915.

SIR,—I have the honour to send my report on the operations of the Levis Animals' Quarantine for the year ending March 31, 1915.

There have been imported during that period, through this station, but very few animals as compared with the previous years, owing to importations from Great Britain having been prohibited on account of the existence of foot-and-mouth disease.

There were imported 445 animals as follows: 5 Belgian draught stallions for the Government of the Province of Quebec; 1 coach horse; 12 deer—3 males and 9 females—for Laurentide Pulp Co., Grand'Mere, Que.; 427 sheep—157 rams and 270 ewes, owned by the following persons: Colonel McEwan, Byron, Ont., 5 rams, 11 ewes, South Down; John Kelly, Shakespeare, Ont., 2 ewes, Hampshire; E. H. DeGex, Kerwood, Ont., 1 ram, 2 ewes, Lincoln; H. Lee, Highgate, Ont., 3 rams, 3 ewes, Lincoln; Guy Drummond, Beaconsfield, Que., 10 ewes, South Down; J. & D. Campbell, Woodville, 1 ram, Shropshire; W. J. Dryden, Brooklin, Ont., 2 rams, 25 ewes, Shropshire; Robt. Blastock, Donerail, Ky., U.S.A., 1 ram, South Down, 1 ram, 1 ewe, Oxford, 3 rams, 70 ewes, Dorset, 140 rams, 146 ewes, Hampshire.

I have the honour to be, sir,

Your obedient servant,

J. A. COUTURE.

APPENDIX No. 5.

TORONTO, April 8, 1915.

SIR,—I have the honour to forward annual report for the year ending March 31, 1915.

During the year my time has been occupied by departmental business at Toronto office of Health of Animals Branch of the Department of Agriculture, and in making investigations from time to time of reported outbreaks of contagious diseases at various points.

Conditions have during the past year changed somewhat from the usual routine, the serious outbreak of disease in the United States necessitating increased vigilance regarding importations from that country.

The European war, which necessitated the congregating together at Toronto of a large number of horses for military use, also required attention from the officers of this department engaged in the work at Toronto. A vast number of horses have been at intervals concentrated at Toronto; a close watch as to conditions was kept by our officers, and unremitting efforts were put forward in looking after the sanitary arrangements of the various concentration yards, and I am pleased to be able to report that nothing more serious than minor ailments was at any time observed.

Disinfection of stock cars occupied the attention of officers specially assigned to that duty.

Regarding contagious diseases of stock in and around Toronto, I am pleased to state that, while many investigations of reported suspected trouble have been made, nothing of a very serious nature, excepting hog cholera, has occurred, the trouble being energetically dealt with.

RABIES.

From time to time isolated cases have come to our notice in districts which were formerly the seat of this trouble. In each case either destruction of contact dogs or enforced quarantine was rigidly enforced, and I am pleased to state the percentage of cases has been greatly reduced.

HOG CHOLERA.

During the year several serious cases of hog cholera developed in vicinity of Toronto, the trouble, we believe emanating from hogs being fed on table refuse.

Every outbreak was energetically dealt with, special attention being given to rigid quarantine enforcement and disinfection of premises.

By visits and keeping in touch with owners of large piggeries on outskirts of Toronto, we are cognizant of existing conditions, and no time is lost in making investigation of any reported suspected trouble.

We have impressed on owners the necessity of keeping premises in sanitary condition and are doing our best to discourage the use of refuse for food.

SHEEP SCAB.

I am exceedingly pleased to state that in this district at least the trouble is apparently eradicated, and that not one authentic case has been dealt with during the past year.

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ANTHRAX.

During the year several investigations of reports of this disease were investigated and, with the exception of one case, vicinity of Georgetown, Ont., all proved to be trouble other than true anthrax.

GLANDERS.

I am pleased to report that not one case of glanders was found in this district during the past fiscal year.

I have the honour to be, sir,
Your obedient servant,

W. W. STORK.

NUMBER of Animals Imported into Canada at Port of Toronto, from April 1, 1914,
to March 31, 1915.

Total number of horses for temporary stay.. . . .	1
" " " permanent stay.. . . .	12
" " mules for permanent stay.. . . .	2
" " Canadian horses returning... . .	21
" " horses entered Canada... . .	34
" " mules entered Canada... . .	2

EXPORT from Toronto from April 1, 1914, to March 31, 1915.

	Cattle.	Calves.	Sheep.	Swine.
Number of animals exported to Great Britain.	Nil.	Nil.	Nil.	Nil.
Number of animals exported to Bermuda.. . . .	169	Nil.	Nil.	Nil.
Number of animals exported to United States.....	28,914	8,490	5,472	1,760

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APPENDIX No. 6.

(W. H. PETHICK, INSPECTOR IN CHARGE, PRINCE EDWARD ISLAND.)

CHARLOTTETOWN, March 31, 1915.

SIR,—I have the honour to submit herewith my annual report for the year ending March 31, 1915:—

As your representative in the Health of Animals Branch, I have visited almost every part of the province, and am glad to state that the health of farm animals has been excellent and that no contagious disease coming under the operation of the "Animal Contagious Diseases Act" has been detected in my district, although quite a number of suspected outbreaks were promptly investigated, of which a special report was sent you at the time of each investigation.

As in former years, I have had the opportunity of meeting a large number of farmers and dairymen and discussing with them the more common contagious diseases of animals; also their care and management both in health and disease, dealing more especially with tuberculosis in cattle, and I am glad to inform you that the stock owners manifest an increasing interest in this important matter. I believe they would welcome any movement giving promise of the ultimate eradication of tuberculosis from the island herds.

Temperature charts and all information relating to tuberculin tests conducted under my supervision have been promptly forwarded to your department.

PORT INSPECTION.

Statements with reference to the inspection of live stock at Charlottetown and Summerside are embodied in the annual reports submitted by the officers at the ports mentioned.

INSPECTION OF FOXES.

A few small outbreaks of scabies were promptly dealt with and controlled, and special reports sent you at the time. I am glad to state that the general health of foxes in the island ranches has been satisfactory.

MEAT INSPECTION.

During the past year, particularly the winter months, my time has been very largely occupied in connection with the meat inspection service in this island. By the daily reports, which are promptly forwarded, you are fully informed regarding the nature and volume and all particulars concerning every phase of the work at each of the establishments under my supervision, consequently I presume that a detailed statement is not here required. I would, however, add that the careful and impartial enforcement of the meat inspection regulations at the several establishments doing an export business has led to a very strong and rapidly growing sentiment in favour of the competent inspection of meats, milk, and other foods for local consumption; in fact the Board of Health is at present asking for legislation along the line suggested.

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I would record my appreciation of the willingness with which the officers associated with me in both divisions of your branch have discharged their duties, as well as the courteous treatment extended to us by the management of the several establishments and transportation companies with which we have had to do. I am also glad to acknowledge the helpful interest taken in our work by the Premier, the Commissioner of Agriculture, and his staff.

I have the honour to be, sir,

Your obedient servant,

W. H. PETHICK,
Inspector.

APPENDIX No. 7.

(C. D. MCGILVRAY, INSPECTOR IN CHARGE, MANITOBA.)

WINNIPEG, MAN., March 31, 1915.

SIR,—I have the honour to submit herewith report in connection with the Health of Animals Branch in the province of Manitoba for the year ending March 31, 1915.

The work of the branch here has consisted in the carrying out of the various regulations and requirements of the Animal Contagious Diseases Act relating to animals quarantine and the control of diseases, as well also of the Meat and Canned Foods Act and the various regulations relating thereto.

DISEASES OF ANIMALS CONTROL.

The services of the officers detailed to this branch of the work have consisted in dealing with the control and eradication of such diseases encountered affecting animals, as are scheduled under the Animal Contagious Diseases Act.

The diseases dealt with have included glanders, hog cholera, mange of horses, sheep scab, and tuberculosis.

Investigations have also been made of such other diseases and conditions affecting animals as appeared to be deserving of consideration and attention.

GLANDERS.

The control and eradication of glanders in the province of Manitoba is, I am pleased to report, still showing satisfactory results. While the number of animals slaughtered during the present year has been slightly in excess of the preceding year, the increase has resulted from a larger number of diseased horses being on a given premises, rather than to an increase in the number of outbreaks.

Glanders Statistics for Manitoba.—The following summary shows the number of horses tested with mallein and destroyed for glanders during the year extending from April 1, 1914, to March 31, 1915:—

Horses submitted to the Mallein Test—	
First test.. . . .	435
Second test.. . . .	45
Third test.. . . .	4
Horses found to react and destroyed for Glanders—	
To a first test.. . . .	38
To a second test.. . . .	5
Of this number, thirteen were clinical cases.	

Total compensation allowed, \$5,313.33; being an average of \$123.57 per animal.

Import Horses tested at destination—	
First test.. . . .	261
Second test.. . . .	5
Destroyed for glanders without compensation—two on second test.	
Total number of horses submitted to a 1st test.. . . .	
“ “ “ “ 2nd “	733
“ “ “ “ 3rd “	50
“ “ “ “ destroyed for glanders.. . . .	4
	45

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HOG CHOLERA.

This disease of swine has prevailed to some extent in certain parts of the province, the number of outbreaks and hogs which it was found necessary to destroy being in excess of the preceding year. Periodical inspection and supervision has been maintained by inspectors of the department in the districts where the disease has appeared, and the owners of hogs have been personally instructed regarding the nature and symptoms of the disease and precautionary measures to be adopted.

HOG CHOLERA STATISTICS FOR MANITOBA.

Number of premises visited	265
“ swine inspected.. .. .	6,386
“ premises quarantined.. .. .	47
“ “ on which the disease was found to exist	26
“ diseased and contact animals destroyed.. .. .	844
“ animals killed for diagnosis and for food purposes under inspectors' supervision.. .. .	50

Amount of compensation allowed for animals destroyed.. .. . \$5,767.97

In connection with a small outbreak which occurred in the district of Kenora, in western Ontario, and which was dealt with by officers of this branch, the following number of animals and premises were dealt with:—

Number of premises visited.. .. .	56
“ swine inspected.. .. .	304
“ premises quarantined.. .. .	11
“ “ on which the disease was found to exist.. ..	9
“ diseased and contact animals destroyed.. .. .	54
Amount of compensation allowed for animals destroyed.. .. .	\$329.83

In the case of all premises where the disease was found to exist, the diseased and contact animals were slaughtered in the presence of an inspector, and the carcasses disposed of under his supervision in a satisfactory manner, either by cremating or burying deeply. The premises were also thoroughly cleansed and disinfected under the personal guidance and supervision of an inspector, and were kept under observation and quarantine restrictions for a period of at least three months. No hogs were allowed to be again introduced or kept on the premises until the quarantine period had elapsed.

In the case of one owner of hogs who violated the quarantine restrictions, he was prosecuted and fined twenty-five dollars and costs.

MANGE OF HORSES.

This disease of horses has been found to exist to a slight extent. Any affected and contact horses were placed under quarantine restrictions and treated at regular intervals, under the supervision of an inspector, by means of the approved official mange preparation until cured of the disease. The harness and stable utensils, together with the premises occupied, were also thoroughly cleansed and disinfected under the supervision of an inspector before the animals were released from quarantine.

Number of horses inspected for mange.. .. .	158
“ affected and contact animals quarantined for treatment..	29

SHEEP SCAB.

This disease has been found among several flocks of sheep in certain parts of the province. All suspected flocks have been carefully examined and the affected and contact sheep have been placed under quarantine restrictions pending satisfactory dipping, at least twice, at intervals of from ten to fifteen days apart. This work is done under the supervision of an inspector, by means of the official lime-and-sulphur

dip approved by the Department. The premises occupied by the affected sheep are cleansed and disinfected with limewash and carbolic acid under the supervision of an inspector.

Number of sheep inspected...	3,657
" diseased and contact sheep quarantined for treatment..	775

TUBERCULOSIS.

During the past year, officers of this branch have submitted to the tuberculin test, 126 cattle intended for export to the United States, and 3 pure-bred cattle intended for shipment to British Columbia. Of this number, 3 reacted to the test and were permanently earmarked and their export prohibited.

Two herds of cattle which are under the control and supervision of the department were submitted to the tuberculin test twice during the year. In all, 120 tests were conducted, 5 animals being found to react to the test, which were earmarked and have been eliminated from the herds.

Fifty-five pure-bred bulls, purchased by the Live Stock Branch, have also been submitted to the tuberculin test, 10 of which were found to react, and were earmarked.

There has also been furnished to practising veterinarians in the province, tuberculin for the purpose of testing private herds, and charts have been received covering the test of 905 cattle, of which 216 reacted to the test and have been earmarked in accordance with the regulations relating to tuberculosis. The total number of tuberculin tests officially recorded during the year in Manitoba was 1,209, the number of reactors amounting to 234, being mostly among the dairy herds.

BLACK-LEG.

This disease has been reported as causing considerable losses among cattle in certain districts, in which it appears to be more or less indigenous. When the presence of the disease is established in any district, the owners of cattle are advised as to the true nature of the disease and to resort to protective inoculation or vaccination of the susceptible animals at proper intervals, together with their removal from known infected areas, and the proper disposal of the carcasses of any animals which have died from the disease, preferably by cremating them completely. From reports received, it would appear that this disease is apparently increasing in prevalency.

During the past year, 2,092 doses of black-leg vaccine have been sold to owners for the purpose of vaccinating their cattle.

INSPECTION OF STOCK AT THE WINNIPEG STOCKYARDS.

In accordance with the requirements of the regulations, all cattle originating west of Winnipeg have been unloaded and inspected at the Winnipeg stockyards, and animals destined for other points have only been allowed to proceed after being duly inspected and accompanied by the inspector's health certificate.

The number of cattle inspected at the Winnipeg stockyards during the year was as follows:—

Cattle destined to points east of Winnipeg...	22,362
" " " west of Winnipeg..	3,842
" " " in the United States..	40,849
" for slaughter at Winnipeg..	38,388
Total cattle inspected..	105,441

Sheep inspections.—In accordance with Ministerial Order No. 40, there have been inspected at the Winnipeg stockyards, 10,369 sheep imported from the United States for immediate slaughter here.

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Hog inspections.—During the month of August last, it was deemed advisable to commence a systematic inspection of all hogs arriving at the Winnipeg stockyards. During the year, 408,585 hogs have been inspected at the Winnipeg stockyards, of which 66,977 were exported to the United States.

Fees collected on inspections of export stock.—During the year fees were collected on inspections of animals intended for export to the United States, amounting to \$1,118.

INSPECTION OF LIVE STOCK CARS AND YARDS.

In accordance with the requirements of ministerial order No. 37, all stock cars destined to Winnipeg, upon being unloaded or arriving empty, have been cleansed and disinfected with limewash and carbolic acid, before being allowed to proceed or returned to general traffic. This work has been done under the personal supervision of an inspector stationed at the stockyards for that purpose, who affixes to each car a card certifying to the date upon which it has been dealt with. During the present year we were able to make arrangements with the several railway companies here to have all their cars dealt with at a central point. This has been found to be a great improvement, and facilitates the work. During the year, 9,643 cars were cleansed and disinfected. The stockyards at Winnipeg, and at all other points throughout the province, have been cleansed and disinfected with limewash and carbolic acid at least once during the season, and at such other times as appeared necessary. This work has been done under the supervision of an inspector, and in the case of any yards being reported or found in an unsatisfactory condition, or poor state of repair, the attention of the railway authorities has been drawn to same, and they have remedied the conditions complained of. A marked improvement in the appearance and condition of the stockyards throughout the province is now noticeable.

ANIMALS' QUARANTINE STATIONS.

The animals' quarantine stations and inspection ports in Manitoba are located at Emerson, Gretna, Bannerman, and Snowflake.

EMERSON QUARANTINE STATION.

This station is located at Emerson, on the international boundary line, at a point where the Canadian Northern and Canadian Pacific lines of railway, and their American connections intersect. The officer in charge at this point is Inspector Bescoby. Besides the inspector in charge, a caretaker is also maintained at this point, whose services are made use of in assisting the inspector in charge, and more especially in keeping the yards and stables in good repair and cleanly condition. The yards and stables are disinfected with limewash and carbolic acid from time to time as required.

During the year there have been presented for entry and inspection the following animals:—

Horses.. . . .	2,550
Mules.. . . .	169
Cattle.. . . .	683
Sheep.. . . .	3,623
Goats.. . . .	263
Swine.. . . .	21
Fees collected.. . . .	\$586.27
One elephant was also inspected.	

There have also been cleansed and disinfected at this point, 852 stock cars returning from the United States.

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EXAMINATION OF PURE-BRED STALLIONS.

During the year, on instructions received, the officers of the branch here have made an examination for soundness and suitability of ten pure-bred Clydesdale stallions being purchased by the Live Stock Branch; also one thoroughbred stallion standing for service in the province.

MEAT INSPECTION DIVISION.

The work in connection with this division has consisted in the carrying out of the various requirements of the Meat and Canned Foods Act, and the regulations relating thereto.

In accordance therewith, inspection is maintained at the following establishments at Winnipeg:—

- The Swift Canadian Co., Ltd., designated as Establishment No. 18.
- “ Gordon, Ironside & Fares Co., Ltd., designated as Establishment No. 19.
- “ Gallagher, Holman & LaFrance Co., designated as Establishment No. 20.
- “ Western Packing Co. of Canada, Ltd., designated as Establishment No. 21.

During the year, an average staff of 14 veterinary inspectors and 4 lay inspectors has been assigned to and stationed at these establishments.

Supervision has also been exercised over the export of meats by retail butchers to points outside the province of Manitoba and prosecution proceedings were instituted in one case against a butcher for shipping unmarked meats, and issuing false certificates, a fine of fifty dollars and costs being imposed by the magistrate before whom the case was tried.

During the year, on instructions received from you, I spent three weeks lecturing on the Better Farming Demonstration train over the Canadian Northern lines of railway in the province of Manitoba, and delivered addresses to farmers on live stock matters at fifty-two places.

I also delivered an address before the Manitoba Cattle Breeders' Association on “Contagious Abortion,” and before the Manitoba Swine Breeders' Association on “Hog Cholera,” at their annual meetings held at Brandon on January 13, 1915.

I also delivered addresses at the Agricultural Conferences that were held under the auspices of the department during the month of March, 1915, at the following points: Morris, Emerson, Selkirk, Stonewall, Portage la Prairie, Neepawa, Carberry, Shoal Lake, and Russell.

All of which is respectfully submitted.

I have the honour to be, sir,

Your obedient servant,

C. D. MCGILVRAY,

Inspector.

APPENDIX No. 8.

(W. H. McKenzie, Inspector in Charge, Saskatchewan.)

REGINA, SASK., March 31, 1915.

SIR,—I have the honour to submit herewith report for the year ending March 31, 1915, in connection with the Health of Animals Branch in the Province of Saskatchewan.

From April 1 to May 21, I was stationed at Vancouver, being engaged in field and boundary inspection work. Acting under your instructions, I proceeded to Calgary on May 22 where I remained until January 7, during which time I performed inspection duties at the Alberta stockyards, and investigated a number of outbreaks of hog cholera in the districts immediately surrounding that city. I was temporarily transferred to Regina, arriving here on January 8. In this province I have personally dealt with two outbreaks of hog cholera, destroying seventy-nine hogs. I also submitted to mallein, and destroyed one horse. Practically all my time has been devoted to the office

GLANDERS.

While efforts towards control and eradication of glanders have not been rewarded during the past year by a marked decrease in the number of animals destroyed, as compared with the year immediately preceding, a reason can, I think, be found in the character of a number of the outbreaks with which your officers have had to deal, in which the infection had been transmitted to a large number of horses before the disease was detected.

Glanders Statistics for Saskatchewan.—Summary showing number of horses and mules tested and destroyed during the year by the various inspectors here.

Total number of horses submitted to 1st test.. . . .				2,137
"	"	"	2nd "	556
"	"	"	3rd "	93
"	"	"	4th "	2
"	"	"	5th "	2
"	mules	"	1st "	16
"	"	"	2nd "	5
Total number of animals destroyed, including three which were not tested.. . . .				186
Total valuation.. . . .				\$28,965.00
Total compensation.. . . .				19,020.00
Compensation withheld on three horses valued at.. . . .				435.00
Number of animals presenting clinical symptoms.. . . .				52

NORTH PORTAL QUARANTINE STATION.

During the past year there has been presented for entry and inspection, at this station, the following number of animals:—

Horses.. . . .	2,729
Mules.. . . .	124
Asses.. . . .	2
Cattle.. . . .	1,976
Sheep.. . . .	141
Goats.. . . .	2
Swine.. . . .	10
Fees.. . . .	\$404.33

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NORTH PORTAL QUARANTINE STATION.—*Concluded.*

Horses tested..	545
Second test..	47
Third test..	5
Mules tested..	20
Second test.. . . . .	....
Third test..	2
Reactors—	
First test..	4
Second test..	4
Cattle tested..	10
Reactors..	Nil.

BIG MUDDY QUARANTINE STATION.

During the past year there has been presented for entry and inspection, at this station, the following number of animals:—

Horses..	732
Mules..	12
Cattle..	94
Fees..	\$134.25
Horses tested..	185
Retested..	10
Mules tested..	6
Reactors..	4
Cattle tested..	Nil.

WOOD MOUNTAIN QUARANTINE STATION.

During the past year there has been presented for entry and inspection, at this station, the following number of animals:—

Horses	1,140
Mules..	17
Cattle..	161
Sheep..	6,747
Fees..	\$641.95
Horses tested..	570
Retested..	20
Mules tested..	2
Reactors..	5
Cattle tested..	17
Reactors..	Nil.

NORTHGATE QUARANTINE STATION.

During the past year there has been presented for entry and inspection, at this station, the following number of animals:—

Horses	72
Mules..	4
Cattle..	10
Goats..	1
Swine..	2
Fees..	\$10.00
Horses tested..	29
Mules tested	4
Reactors..	Nil.
Cattle tested..	Nil.

WILLOW CREEK QUARANTINE STATION.

During the past year there has been presented for entry and inspection, at this station, the following number of animals:—

Horses	325
Mules..	12
Cattle..	6
Sheep..	1,870
Fees..	\$133.05
Horses tested..	319
Mules tested..	12
Reactors..	Nil.
Cattle tested..	Nil.

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Summary showing total number of animals presented for entry and inspection and submitted to mallein and tuberculin tests at the different quarantine stations in this province:—

Horses inspected..	4,998 (110)
Mules inspected..	169 (2)
Horses submitted to 1st mallein test..	1,664
“ “ 2nd “	77
“ “ 3rd “	5
Mules “ 1st “	44
“ “ 3rd “	2
Animals which reacted and were refused entry..	17
Cattle inspected..	2,247 (247)
“ submitted to the tuberculin test..	37
“ reacted..	Nil.
Sheep inspected	8,758 (2)
Swine “	12 (10)
Goats “	3
Asses “	2
Fees collected..	\$1,323.58

HORSE MANGE.

Outbreaks of this troublesome malady have been dealt with from time to time, and for the most part, have been confined to the districts of Macrorie, Dunblane, Gull Lake, and Neville.

On account of the severity of the weather it is absolutely dangerous to treat affected animals during the winter and early spring, as pneumonia, pleurisy, etc., are not unlikely to follow the treatment. Realizing this, you issued instructions to have this procedure discontinued, and insisted upon the strict quarantine of affected and contact animals, until the advent of mild weather. While this is the only safe course to pursue, it renders the eradication of mange in this province an infinitely more difficult matter than in a milder climate. This disease showed a slight increase over last year.

Total number of animals quarantined..	296 (2)
“ “ affected..	189 (2)

BLACK QUARTER.

As this disease is not dealt with under the Animal Contagious Diseases Act, reliable statistics as to its prevalency are not available. While approximately three times the quantity of vaccine has been sold this year as last, it does not necessarily follow that the disease is more prevalent than formerly, as a campaign has been inaugurated by the Provincial Department of Agriculture resulting in municipalities strongly advocating the use of vaccine for all young stock. From the numerous applications received for vaccine and literature relating thereto, it is obvious that stock owners appreciate the value of preventive inoculation.

Total number of doses of black-leg vaccine sold during the past year.	20,447
Instruments..	319
Needles..	274
Value..	\$1,216.10

TUBERCULOSIS.

The following will show what has been done in connection with this disease during the past year:—

Imports.—Thirty-seven (37) cattle were submitted to first test. No reactions.

Exports.—None tested.

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Official.—(Herds under control and for Live Stock Branch.)

One hundred and thirty-seven (137) cattle were submitted to first test, of which ten (10) reacted, and two (2) gave suspicious reactions.

Ninety-four (94) were submitted to second test, of which eight (8) reacted, while five (5) gave suspicious reactions.

Seventy-one (71) were submitted to third test, of which seven (7) reacted.

Five (5) were submitted to fourth test, with no reactions.

General.—Under this heading are shown cattle tested by private veterinarians with tuberculin supplied by your department through this office.

Two hundred cattle were submitted to the first test, of which fifty-five (55) reacted, eight (8) were suspicious, and one hundred and thirty-seven (137) showed no reactions.

Total number of tests.. . . .	544
“ reactors.. . . .	80

HOG CHOLERA.

This highly infectious disease has shown a slight increase over the preceding year. During the first nine months of the year just closed, serious outbreaks were dealt with in the Milestone, Fairlight, Estevan, and Saskatoon districts, but I am pleased to inform you that the prompt and energetic measures taken by your officers have achieved gratifying results, as we have been comparatively free from this malady since last January. Many suspected outbreaks have been investigated which proved to be the result of unsanitary surroundings and insufficient food. The policy comparatively recently adopted, of destroying apparently healthy hogs which have been in contact with diseased ones, has already shown marked results.

Total number of hogs quarantined.. . . .	7,353
“ “ “ destroyed as diseased.. . . .	4,349
“ “ destroyed for post-mortem purposes.. . . .	50
Value.. . . .	\$39,197.58½
Total compensation awarded.. . . .	25,216.19
Compensation withheld on 197 hogs valued at.. . . .	1,373.30

DOURINE.

Fortunately, this disease does not exist to any marked extent in this province. Nevertheless, your officers, being aware of its insidious nature, avail themselves of every opportunity of carefully inspecting all horses which manifest even the slightest symptoms. The suspected animals are placed under quarantine, samples of blood secured and forwarded to the laboratory at Lethbridge for the complement fixation test. Statistics relating to this disease will be furnished by Dr. Hargrave, under whose jurisdiction it is dealt with.

RABIES.

Two suspected cases of this disease were investigated during the past year, one in Saskatoon, the other in Regina. In neither case was a positive laboratory diagnosis made, nor were any affected animals discovered by your inspectors.

SHEEP SCAB.

This disease did not make its appearance during the past year.

INSPECTION OF LIVE STOCK CARS AND YARDS.

In accordance with the requirements of ministerial order No. 37, all empty stock cars arriving at or passing through Moosejaw, unless bearing evidence of having been so treated, are cleansed and disinfected under the direction of an inspector.

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Total number of cars cleansed and disinfected, 2,084.

On account of the outbreak of foot-and-mouth disease in the United States, special measures were taken to prevent the introduction of infection through unsanitary stock cars, all such cars arriving at North Portal being cleansed and disinfected under the direction of one of your officers before being allowed to proceed into Canada.

Total number of cars cleansed and disinfected, 472.

The stock yards throughout the province are cleansed and disinfected under the direction of an inspector from time to time as exigencies require.

STALLION INSPECTIONS.

During the past year thirty (30) stallions were examined for soundness for the Live Stock Branch, and one stallion was examined for identification at the request of the Canadian National Records.

I have the honour to be, sir,

Your obedient servant,

W. H. McKENZIE,

Inspector.

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APPENDIX No. 9.

(J. C. Hargrave, Inspector in Charge, Alberta.)

MEDICINE HAT, March 31, 1915.

SIR,—I have the honour to submit herewith my report for the province of Alberta for the year ending March 31, 1915, in addition to which reference will be made to portions of Saskatchewan and British Columbia within which a part of the work of your department is under the supervision of this office. During this period the diseases demanding the greater portion of the time of your inspectors being, as was the case a year ago, dourine, hog cholera, and mange.

DOURINE.

In my last annual report it was necessary to refer to a very extensive outbreak of this disease in the southwestern portion of Alberta, which outbreak was actively contended with, and considerable progress made in controlling the situation. During the year just ended, the different affected premises remaining in quarantine from last year were further dealt with and from a number of them the disease was eliminated. A few of them, however, are still receiving our attention, together with other premises whereto the disease had extended and been found during the present year.

The number of infected animals found, while considerably less than a year ago, will convey to you the fact that the disease had extended to a much larger number of premises than at first thought. With reference to these additional premises on which the disease has been detected, in two instances it would appear to be a recurrence of the disease, as in both cases the disease was detected and dealt with and believed to have been entirely eliminated some six years ago.

Unfortunately the four large Indian reserves to the south of the main line of the Canadian Pacific Railway, in this province have the infection upon them, and with the trouble at times experienced in dealing with the occupants of these reserves, it has, at times, been a difficult matter to determine that any progress was being made. This is unfortunate, particularly as dourine existing on any of these reserves is a menace not only to the horses upon them, but also to horses in the surrounding districts, as in the case of two reserves, owing to the non-fencing, there is nothing to prevent the mixing of the horses from the surrounding country with those upon them. This is, of course, a very serious matter and one in which the inspectors require to secure the co-operation of all the horse owners in the neighbourhood.

The practice of a general testing of all stallions in the neighbourhood of any outbreak has been followed as heretofore in addition to which the majority, if not all, of the different herds of horses immediately adjoining the different Indian reserves are being dealt with as exposed or contact herds. You will, however, appreciate the fact that because of the unfenced condition of certain of these reserves, horses are free to stray on and off at will, and while an effort has been made to keep track of such estrays, this is practically impossible, particularly on the two large reservations, the Blood and Blackfoot.

The work throughout in connection with this disease has been prosecuted with every possible effort and all the inspectors giving attention to this work have rendered excellent services and in almost every case have received hearty co-operation from the stock-owners. The disease was also encountered to the south of Maple Creek, Sas-

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katchewan, but whether introduced from Alberta or a recurrence has not been definitely determined. It would, however, appear to be confined to four different herds.

I must again refer to the excellent work performed at the laboratory under the direction of Dr. Watson, and to indicate the amount of work performed at that point and the attention given to the disease in the field; 6,194 doses of serum were collected and tested, out of which number 26 only were bad specimens and unfit for testing, a most creditable record for the field inspectors collecting such material, in a great many cases under most adverse conditions.

Statistics for Alberta.

Number of premises quarantined.. . . .	185
“ animals quarantined.. . . .	1,139
“ “ slaughtered (including 11 registered animals)...	367
Of the 367, six head valued at \$656 were not compensated.	
Value of remaining 361.. . . .	\$44,431 00
Compensation.. . . .	29,619 63

In addition to this, one jack was secured and forwarded to the laboratory for experimental purposes; value \$200.

Statistics for Saskatchewan.

Number of premises quarantined.. . . .	77
“ animals quarantined.. . . .	450
“ “ slaughtered, 23 (including one pure bred).	

One of the number slaughtered without compensation; the remaining 22 were valued at \$3,875; compensation, \$2,583.19.

GLANDERS.

The amount of time devoted to this disease has been considerably less than during the previous two years, it being found necessary to make approximately only a little more than one-third the number of tests, with the result that 72 horses were slaughtered as compared with 99 a year ago and 151 two years ago. Practically all of the 72 slaughtered were the result of two outbreaks, one in the Stirling district south-east of Lethbridge, and the other in the vicinity of Calgary, the former being in a farming district, and the latter were horses belonging to construction outfits. These two outbreaks accounted for 62 of the 72 head; the remaining 10 cases were isolated cases and all found to the south of township 40.

Statistics Native Horses.

Number of horses tested once.. . . .	950
“ “ “ twice.. . . .	218
“ “ “ thrice.. . . .	38
“ “ slaughtered on inspection.. . . .	1
“ “ “ first test.. . . .	63
“ “ “ second test.. . . .	5
“ “ “ third test.. . . .	3
Value of the 72 head, \$11,615; compensation, \$7,743.32½.	
Number of horses presenting clinical symptoms.. . . .	19
Import horses tested once.. . . .	11
Horses seized by customs and tested once.. . . .	12
“ “ “ “ twice.. . . .	4

MANGE.

It would appear that this disease affecting horses has been all but eradicated from the province, as during the year it was found upon three premises only, involving the control of 26 horses, of which number 5 only presented clinical evidence of mange. These figures, on being compared with the statistics for the two years previous, show

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a considerable improvement, and there should be no difficulty in eliminating this infection during the present year, although, no doubt, isolated cases will continue to be found from time to time.

A considerable improvement is also to be noted in the figures for cattle mange, and during the year it was gratifying to be able to recommend to you the reduction in the mange area, removing therefrom a portion of the area in both Saskatchewan and Alberta, totalling some 352 townships, and, with the very slight amount of the disease detected in the Maple Creek district during the immediate past winter, it is possible that the result of the ensuing seasons' work may be such as to make a further reduction in the area by eliminating practically all of the area in Saskatchewan.

In addition to the cattle quarantined and dipped according to the regulations a large number of stockmen voluntarily dipped their herds, although no evidence of mange was detected.

Statistics for Alberta.

Number of premises quarantined.. . . .	110
“ cattle quarantined.. . . .	26,709
“ “ dipped once.. . . .	44,424
“ “ “ twice.. . . .	33,368
“ “ hand treated.. . . .	621

Statistics for Saskatchewan.

Number of premises quarantined.. . . .	8
“ cattle quarantined.. . . .	3,679
“ “ dipped once.. . . .	13,506
“ “ “ twice.. . . .	12,568
“ “ hand treated.. . . .	84

In the Kootenay district of British Columbia it was found necessary to quarantine two premises on account of this disease, involving the control of 48 cattle. The animals in question were shipped from within the mange area for immediate slaughter, but on reaching destination it was found that it would be some considerable time before this would be carried into effect, and it was considered advisable to eliminate any possible chance of the infection being introduced into the district; consequently, the two herds, with the exception of 13 that were killed, were treated, although none of the animals presented any evidence of the disease.

TUBERCULOSIS.

During the past year a considerable number of dairy animals as well as pure-breds were submitted to the tuberculin test, both by inspectors of the department and by qualified practitioners, the latter being supplied tuberculin by the department. The total number of tests made by inspectors of the department was 380; number of reactors, 19, all of which were ear-marked in accordance with the regulations.

Total number of animals tested by practitioners, 144. Of this number, 11 reacted and were also ear-marked.

BLACK QUARTER.

Reports continue to be received as to losses from this disease, but I am unable to state with any degree of accuracy whether it has been greater than in previous years. I am convinced, however, that a certain percentage of the loss attributed to this disease is due to poisoning by Death Camus (*Zygadnus Venenosus*), a poisonous perennial herb which is quite plentiful throughout the province but which, however, is gradually becoming recognized by stockmen, particularly sheep-men, who make provision against the loss by supplying their sheep-herders with powders of sulphate of aluminum and permanganate of potash.

During the year, stockmen have made greater use of blackleg vaccine. Twenty-five thousand seven hundred and ninety-five (25,795) doses were supplied by the office and inspectors of the province, as compared with seventeen thousand eight hundred and seventy-five (17,875) a year ago.

RABIES.

My previous report shows that this disease was introduced into the province some four years ago, and the following year apparently successfully eradicated, as last year and this year there has been no recurrence of the disease.

HOG CHOLERA.

In my last annual report reference was made to the increase of hog cholera in the province, and in a great number of cases due to the feeding of uncooked refuse and garbage from hotels and restaurants. It was thought, however, that breeders of hogs were commencing to realize the necessity of thoroughly cooking this material or discontinuing its use altogether. This year, however, owing to the failure of crops in the southern part of the province, feed was very scarce and in a great many instances owners were unable to purchase it, with the result that hogs either ran at large or were fed such refuse as could be found in the different cities, towns, and villages, with the result that the disease existed to a greater extent than ever before, and as was the case last year the more severe and larger outbreaks occurred in the immediate vicinity of three large cities of the province.

Needless to say every effort has been made by inspectors to interest the councils of the various cities in the proper disposal of this material, and to some extent more or less success has been achieved.

The disease was continually met with until towards the end of January, since when practically no further outbreaks have occurred.

Just what will be the result of the efforts put forward during the year of course remains to be seen, but I am of the opinion that the ensuing year will show a very large decrease as inspectors on every visit made have been particular to carefully instruct the owners regarding the various means by which the disease may be carried, and the necessity of thoroughly cleansing and disinfecting infected premises; and the distributing of departmental literature upon the subject must result in a more thorough and general knowledge of this disease and success towards its eradication.

Number of premises quarantined during the year.. . . .	306
" hogs involved thereon.. . . .	15,552
" diseased and contact hogs destroyed.. . . .	9,450
Value of 9,325 hogs compensated.. . . .	\$77,416.45
Compensation.. . . .	51,610.50
Value of 120 hogs (including three strays) not compensated.. . .	\$90.00

In addition, there were postmortemed and removed from quarantined premises and slaughtered for consumption, 928 hogs. I must also mention that in the Kootenay district of British Columbia three premises were quarantined, the hogs thereon, numbering 44, were slaughtered, being valued at \$404; compensation, \$269.33.

BOUNDARY STATIONS.

Pinhorn Entrics.

Horses.. . . . (1 foal).	58
Mules.. . . .	3
Sheep.. . . . (lambs, 2,359).	4,420
Fees collected.. . . .	\$151.13

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A customs seizure consisting of two mules and two horses was tested by the inspector in charge of the port, one of the mules reacting. All four head were returned to the United States.

Coutts Entries.

Horses..	(foals, 67).	711
Mules..		38
Cattle..		240
Sheep..	(lambs, 1,781).	33,640
Swine..		1
Fees collected..		\$871.25
Number of reactors rejected..		3
“ contacts rejected..		11

Twin Lakes Entries.

Horses..		205
Mules..		2
Jacks..		2
Fees collected..		\$46.25
Number of reactors rejected..		1
“ contacts rejected..		15

Georgetown Entries.

Horses..	(3 foals).	57
Fees collected..		\$12.75
Number of reactors		Nil.

Kingsgate Entries.

Horses..	(39 foals).	677
Mules..		32
Cattle..		98
Sheep..		4
Goats..		5
Fees collected..		\$125.65
Number of reactors		Nil.

I have the honour to be, sir,
Your obedient servant,
J. C. HARGRAVE,
Chief Inspector for Alberta.

APPENDIX No. 10.

(*S. F. Tolmie, Inspector in Charge, British Columbia.*)

VICTORIA, B.C., March 31, 1915.

SIR,—I have the honour to submit my annual report for the year ending March 31, 1915.

Boundary inspection work has required close attention during the year, and particularly so since the outbreak of foot-and-mouth disease in the United States. Great care has been exercised by your inspectors to enforce the foot-and-mouth regulations.

During the year, 1,757 horses, 35 foals, 43,813 sheep and 6 lambs, 133 goats and 3 kids, 4 deer, 466 cattle and 63 calves, 71 mules, 5 asses and 1 foal, and 1 hog were imported through the live stock ports of this province; \$2,029.51 were paid in fees. One hundred and eighty-eight horses and mules were accompanied by Bureau of Animal Industry charts showing that they had passed the mallein test. Four hundred and forty-nine horses, mules and asses were subjected to the mallein test by your officials. Sixty-seven head were rejected as reactors and in contact animals. Eleven hundred and fifty head of horses, mules and asses were entered for temporary stay only. Of the above mentioned cattle, 125 belonged to settlers, 97 head were tested with tuberculin, while 66 head were accompanied by Bureau of Animal Industry charts. One hundred and fifty-eight head were brought in for immediate slaughter only.

Twelve cattle and three calves, nineteen sheep and two swine were inspected for export during the year. Summary of port inspection by ports is attached herewith.

GLANDERS.

Fortunately only a few cases of glanders have been encountered. Eighteen head of horses were destroyed on mallein test for this disease, six of which were clinical cases. The value of the horses destroyed was \$2,350. Compensation paid amounted to \$1,566.63.

RABIES.

Rabies appeared in Cowichan early in 1914 and a muzzling order covering Cowichan Electoral District was enforced in May of the same year. Later the disease appeared in Ladysmith, and a muzzling order was put in force covering that town on September 22. In all, some forty-six premises were placed in quarantine on account of rabies. Thirty-nine cases were dealt with, thirty-eight of which were in dogs, and one in a cow. It was necessary to prosecute for infraction of the regulations in 109 instances. Convictions were obtained in 100 cases, and \$958 was paid in fines. This work was carried on by Inspector Maconachie in a very efficient manner. The diagnosis of the inspector on the ground was confirmed in laboratory tests by Assistant Pathologist Hadwen. Valuable assistance was received from the provincial and the municipal authorities in enforcing the regulations. At this writing it appears that I will be able to recommend the cancellation of the muzzling orders at an early date.

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HOG CHOLERA.

Hog cholera was the most important disease dealt with in the province. In all, 1,670 hogs were destroyed, and valued at \$15,316.60. Compensation was paid to the amount of \$10,210.88. Compensation on 791 hogs and amounting to \$3,845.95 was withheld on account of feeding garbage and infractions of the regulations. One hundred and nine premises were quarantined on account of this disease during the year. Your inspectors have visited the districts in which swine are kept and have disseminated as much information as possible concerning this disease and its prevention and have distributed a large number of hog cholera bulletins and copies of the regulations relating thereto. I feel that a great deal can be accomplished by the distribution of information among hog owners. As in previous years, a very large proportion of the outbreaks was on premises where the practice of garbage feeding was followed. A number of outbreaks were also directly traceable to swine brought from points outside the province. Only twenty-eight premises still remained in quarantine at the end of the year.

BLACKLEG.

Blackleg has caused loss in some districts, principally in the range sections. Twelve thousand, eight hundred and forty doses of blackleg vaccine have been distributed by your officers. Vaccination is becoming quite general as a preventive measure.

TUBERCULOSIS.

The Dominion Government herd of cattle at the Experimental Farm, Agassiz, has been tested by your inspectors, but no reactors were found. A number of cattle have been tested during the year for the Live Stock Branch in connection with their distribution of pure-bred sires.

FOOT ROT.

This disease appeared in a few farms, and the affected animals are now receiving treatment.

INSPECTION OF STOCK CARS.

Three thousand and sixty-seven stock cars were cleansed and disinfected under the supervision of your inspectors, and a number of cars entering Canada were returned to the United States on account of faulty cleansing and disinfection.

A few changes occurred in your British Columbia staff during the year. Inspector McKenzie was removed to Calgary. Inspector Richards resigned from the service, and Inspector Maconachie was transferred to Victoria.

Disease among cattle appeared in the Kamloops and Cariboo districts. Inspector Paxton and Assistant Pathologist Hadwen are conducting investigations in connection with these outbreaks, but no definite information is yet available concerning them.

I have the honour to be, sir,

Your obedient servant,

S. F. TOLMIE,
Chief Inspector for British Columbia.

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IMPORT INSPECTIONS.—SUMMARY.

Port.	Fees.	Horses.	Sheep.	Goats.	Deer.	Cattle.	Mules.	Asses.	Burro.	Swine.
	\$ cts.									
Vancouver.....	432 24	113	14,886	101	4	2	20	0	0	0
White Rock.....	838 55	1,019	20,535	25	0	68	24	4	0	0
New Westminster.....	10 20	0	0	0	0	27	0	0	0	0
Huntingdon.....	19 60	200	5,381	4	0	86	2	0	1	0
Bridenville.....	26 25	24	0	0	0	12	0	0	0	0
Myneaster.....	1 00	1	0	0	0	0	0	0	0	0
Keremeos.....	33 00	103	0	0	0	1	5	0	0	0
Osoyoos.....	18 25	126	0	0	0	10	4	0	0	0
Rykerts.....	0 00	6	0	0	0	0	4	0	0	0
Nelson.....	84 00	47	749	2	0	30	4	0	0	0
Rossland.....	92 55	18	40	1	0	71	0	0	0	0
Midway.....	55 25	21	0	0	0	14	0	0	0	0
Grand Forks.....	164 65	51	0	0	0	128	8	0	0	0
Victoria.....	77 97	25	2,222	0	0	17	0	0	0	1
	2,029 51	1,757	43,813	133	4	466	71	4	1	1

ANALYSIS OF IMPORTATIONS.—SUMMARY.

Port.	Horses.					Mules.			Burro, Tested.	Asses, T. S. O.
	B. A. I.	Tested.	T. S. O.	Ret. Can.	Inc. to Dest.	Tested.	B. A. I.	T. S. O.		
Vancouver.....	24	6	68	16	0	0	20	0	0	0
White Rock.....	18	21	962	18	0	0	0	24	0	4
New Westminster.....	0	0	0	0	0	0	0	0	0	0
Huntingdon.....	85	64	39	12	2	0	2	0	1	0
Bridenville.....	0	23	0	0	0	0	0	0	0	0
Myneaster.....	0	1	0	0	0	0	0	0	0	0
Keremeos.....	17	73	8	0	0	3	2	0	0	0
Osoyoos.....	0	122	3	0	0	4	0	0	0	0
Rykerts.....	0	6	0	0	0	4	0	0	0	0
Nelson.....	0	10	37	0	0	2	2	0	0	0
Rossland.....	0	18	2	0	0	0	0	0	0	0
Midway.....	0	21	0	0	0	0	0	0	0	0
Grand Forks.....	4	58	0	0	0	0	0	0	0	0
Victoria.....	14	13	3	0	0	0	0	0	0	0
	162	436	1,122	46	2	13	26	24	1	4

Of the above total horses tested, 2 were tested to clear and entry previously made.

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ANALYSIS OF IMPORTATIONS, CATTLE.—SUMMARY.

Port.	Cattle.						
	Settlers.	Show.	Tested,	B. A. I.	Grazing.	I. S. D.	Under 6 mos. old.
Vancouver	1	1	0	0	0	0	0
White Rock	36	0	7	24	1	0	0
New Westminster	0	0	0	19	8	0	0
Huntingdon	61	0	5	19	0	0	2
Bridenville	9	0	1	0	0	2	0
Myncaster	0	0	0	0	0	0	0
Keremeos	1	0	0	0	0	0	0
Osoyoos	8	0	2	0	0	0	0
Rykerts	0	0	0	0	0	0	0
Nelson	3	1	19	0	0	7	0
Rosslund	0	0	12	0	0	63	0
Midway	0	0	11	0	0	0	3
Grand Forks	3	0	40	0	0	76	9
Victoria	3	0	0	4	0	10	0
	125	2	97	66	9	158	14

Of the above total cattle tested 5 were tested to clear entry previously made.

IMPORT INSPECTIONS.—SUMMARY.—REACTORS, RETESTS, REJECTIONS, ETC.

Port of	Horses.					Mules.	
	Held. Retest.	Reactors.	Suspected.	In Contact. Rejected.	Re-present- ed. Passed.	In Contact. Rejected.	Re-present- ed. Passed.
Victoria	5	1	2	2			
Nelson	4	2	0	1	1		
Osoyoos	0	4	0	24		2	
Keremeos	0	5	0	21	20	1	1
Bridenville	0	1	0	1			
	9	13	2	*49	21	3	1

* All returned to United States.

APPENDIX No. 11.

(*C. Maconachie, Inspector, Cowichan District.*)

MARCH 31, 1915.

SIR,—I have the honour to submit herewith a report covering my work under the Health of Animals' Branch (contagious diseases) during the period between the dates April 1, 1914, and March 31, 1915.

RABIES.

During this time I have been engaged, practically entirely, in dealing with the outbreak of rabies in the Cowichan electoral district and the city of Ladysmith.

The first case reported occurred in the city of Duncan on March 13 to 16, 1914. From this date onward, until the month of July, cases occurred with a certain amount of regularity, with periods of incubation averaging about twenty-three days. In July, two cases occurred within a few days of each other, with incubation periods reaching to about thirty and thirty-two days. From that time until the present the number of cases has considerably diminished. The length of the incubation period has become difficult of definition, but since in one case, manifesting symptoms on December 17, contact with a rabid subject was at least possible on some date between July 11 and 14, and as no other source of inoculation, since that time, can be determined, it appears not unreasonable to suppose that this incubation period was one of five months. The last known case occurred on January 24. In this instance again the incubation period was apparently an extended one; since contact probably occurred on or about August 17, making the period roughly five months. The majority of the thirty-nine known cases have been of the dumb form. In the Ladysmith area, nine known cases have occurred, of which only one took the furious form. In Nanaimo, three suspected cases have been reported, all of which have been investigated. Of these only one appeared at all suspicious. This case bore some resemblance to the dumb form of rabies, but making allowance for the fears of the people who made reports, I am inclined to class the case as one of distemper, with nervous symptoms. The case was not reported until after the death of the dog. No other cases have been reported in that neighbourhood since that time. In the Cowichan electoral district a muzzling order came into effect, by Order in Council, on May 14, 1914. In the city of Ladysmith a similar order became effective on September 22, 1914. These orders together affect a district of about 160 square miles, and have been of great assistance in controlling the outbreak.

In the Cowichan district the population is almost exclusively English. Of these, many have lived in India and have had, at least, considerable hearsay acquaintance with rabies. They are thus perfectly well qualified to judge of every manifestation and development of the disease, and the result, where it is not actual opposition, is well-pronounced scepticism and resentment, both sufficient to preclude the likelihood of active co-operation with the various officials engaged in suppression of the outbreak.

Another difficulty arises from the fact that three different bodies of authority are concerned, viz., provincial, civic, municipal. Each of these bodies, the provincial department, the city council, and the municipal council has at one time or another taken the ground that the matter of enforcement of the order is properly the duty of the Dominion Government alone. This position has been abandoned in each case, but the fact that it was ever occupied serves to indicate general feeling; consequently

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the continued presence of an inspector of this department has been very necessary. At present, with the beginning of the warm weather, this necessity continues, since with a lessening in the number of cases, and a lengthening of the intervals between their occurrence, impatience is manifested at the continued enforcement of the order.

HOG CHOLERA.

Six outbreaks of hog cholera have been dealt with on Vancouver Island, and one on Mayne Island.

In dealing with this disease I have found recently that the practice of feeding swill is becoming much less general than formerly on Vancouver Island.

Hog raisers are apparently becoming aware of the danger of this practice, and even Chinamen are disinclined, generally, to take the risks involved in it.

BOUNDARY INSPECTION.

From November 7 to 17, 1914, I was employed at Huntingdon in boundary inspection.

I have the honour to be, sir,

Your obedient servant,

C. MACONACHIE,

Inspector.

SUMMARY CASES, Prosecutions, etc., Supplement No. 1 to Report of C. Maconachie, *re* Rabies outbreak Cowichan Electoral District, April 1, 1914, to March 31, 1915.

Number of Cases.				Number of Prosecutions.			Con- vic- tions.	Number of Dis- missals.			Charge Withdrawn.			Amount of Fines and Costs.				Cases Prosecuted by Department.			Information Laid by No.— Inspector — Cases.		

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APPENDIX No. 12.

(J. H. Frink, Inspector, St. John, N.B.)

ST. JOHN, N.B., March 31, 1915.

SIR,—I beg to submit my annual report covering work at this station.

Inspection export fat cattle and sheep from this port to Great Britain has ceased.

Inspection export horses.—This has been confined to horses for the allied armies in Europe, numbering 9,327. These animals, generally speaking, were in good condition and free from serious contagious diseases, common in large numbers of horses from many parts of the continent of North America, stabled together. The usual diseases of a catarrhal nature were present, and particular pains were taken, and with success, to prevent their spread among the horses owned and used by citizens, remount animals being thoroughly isolated and strict measures of cleansing and disinfection were pursued. Those animals not fit for shipment overseas, and which were to be sold among farmers and others, have been subjected to the mallein test, so that any danger of glanders being distributed from this source has been overcome.

Imports of cattle, sheep, and other ruminants from Great Britain have fallen off perceptibly, owing to war conditions, and the prevalence of foot-and-mouth disease—not only in Great Britain but in the United States.

CONTAGIOUS DISEASES.

Hog Cholera.—Two outbreaks of this disease in the vicinity of Moncton, N.B., in the winter of 1914 were followed by a third in May, on premises situated on the Irish-town road in the same district, all affected hogs having been garbage fed. The disease did not spread from the infected places, and they have been discharged from quarantine, diseased animals and contacts having been destroyed, and as far as known this province is free from this scourge.

Broncho-Pneumonia.—An outbreak of this disease appeared at Richibucto, N.B.,. About 200 pure-bred hogs were on these premises. A number of animals died, particularly young animals; some difficulty arose in determining the nature of this disease, and its complete identification was made at the biological laboratory at Ottawa. After occasioning considerable loss the disease disappeared as suddenly as it came.

Glanders in Horses.—The only case of glanders coming under my observation was found at the quarantine station here, in a number of horses imported from the United States. This animal reacted to mallein and was destroyed. The contacts were subsequently tested without reaction.

Tuberculosis.—The testing of cattle has been carried on at Experimental Farms at Nappan, N.S., and at Fredericton, N.B. These herds are now free from tuberculosis, and with a reasonable amount of care can be kept so. Tests were also carried out on supervised herds, and those reacting were voluntarily destroyed by their owners.

PREVENTIVE MEASURES.

The carrying out of all orders relating to foot-and-mouth disease has been vigorously attended to, and thus far with success, the railways and other common carriers co-operating heartily in the work of cleansing and disinfection of stock cars and yards.

Prosecution under the Animal Contagious Diseases Act took place at Fredericton, N.B., for infraction of regulations and orders, the defendant having knowingly and openly violated regulations governing the introduction of horses from the United

States. A conviction was secured and a suitable penalty imposed, which will have a salutary effect in the administration of this Act, this being the first prosecution under this Act in the province.

IMPORTATION OF HORSES.

From Great Britain.—(Clydesdales.)	21
“ United States	27
“ West Indies	3
	—
Total	51
	—

Importation of cattle from Europe.—Forty-four head of pure-bred Jersey cattle arrived here on 10th March from the Island of Jersey, and are yet in quarantine. The quarantine station has been well maintained, and the work attendant has been satisfactorily performed.

I have the honour to be sir,
Your obedient servant,
JAMES H. FRINK,
Inspector.

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APPENDIX No. 13.

(Chas. H. Higgins, D.V.S., Pathologist, Biological Laboratory, Ottawa.)

OTTAWA, March 31, 1915.

SIR,—I have the honour to present this my sixteenth annual report as an official of the department, and my thirteenth as its pathologist.

During the year we have experienced an increase of work in excess of that common to any similar period since the establishing of this laboratory. A very noteworthy increase has been occasioned by the requirements of the Militia Department, a result of the European war.

Circumstances have prevented the enlargement of the premises, a pressing necessity for many years past, and it is now doubtful whether an enlargement at the present site is desirable in view of the fact that many phases of our experimental work require a greater land area than is now available. It is to be hoped that an enlarged laboratory on a comprehensive scheme may be a possibility in the near future to meet with the growing demands of the live stock interests.

From our stock of small animals we have supplied eighty-one guinea-pigs for other laboratories.

The routine examination of specimens has consumed a great deal of our time, we having dealt with 817 series during the year.

I present herewith details connected with the various phases of our work during the year just ended.

LABORATORY STAFF.

The staff during the year has been the same as that of the previous year with the exception that during the month of October (20th) Dr. Evans was granted military leave for the purpose of forming a veterinary corps to be attached to the Canadian Expeditionary Force, and has since that time been on active service.

In December, I was delegated to attend the meeting of the American Society of Bacteriologists, held in Philadelphia, and at that time secured much valuable information for the improvement of our laboratory work.

A number of articles have been prepared during the year by members of the laboratory staff. A few indicated below, are presented as supplements to this report:—

I. Special Report: "The Care, Sanitation and Feeding of Foxes in Captivity" by Chas. H. Higgins, Pathologist. Reproduced herewith as Supplement No. 1.

II. "*Leucocytozoon anatis*." *Parasitology*, vol. VIII, No. 1, June 25, 1915, by A. B. Wickware, Assistant Pathologist. Reproduced herewith as Supplement No. II.

III. "An economical Measuring Device," by Charles H. Higgins, Pathologist. This has not been published elsewhere but is presented herewith as Supplement No. III.

I have been engaged during the year in manufacturing various biological products and, upon Dr. Evans' departure, assumed the responsibility connected with the preparation of strangles vaccine.

The work on contagious abortion formerly in the hands of Dr. Evans was on his departure transferred to Dr. Reid, who has made satisfactory progress.

Dr. Wickware and myself have been able to care for the major portion of the routine, thus giving Dr. Reid an opportunity to spend more time upon this very

important subject. His findings indicate that satisfactory results are being secured, and while it is yet too early to draw definite conclusions we all believe that he is securing information that will greatly assist in controlling this very annoying malady.

As formerly, Dr. Wickware has assumed many of the investigations arising from the routine examination of material forwarded for purposes of diagnosis. In this connection he has been able to investigate a peculiar malady in ducks which seems to be associated with the presence of a leucocytozoon (*leucocytozoon anatis*) in the blood. His findings in this connection are presented as a special supplement to this report (Supplement No. II).

As formerly, Dr. Reid was granted leave of absence for the purpose of assisting the Faculty of Comparative Medicine of Laval University in Montreal.

Mr. N. M. Guiou was employed from May 16 to September 30 inclusive. As during the previous year his services were made use of in connection with our turkey experiments, he having full charge of the flock. In this work we secured some additional data in connection with the rearing of turkeys, but in the main our recommendations to turkey raisers remain the same, and will be found in Bulletin No. 17, entitled "Entero-hepatitis."

Mr. R. Fee, our caretaker, has as formerly been employed in connection with the various duties coming under his supervision.

Mr. D. Paquette has attended to the clerical work of the laboratory and, when not fully employed at such duties, his services have been utilized with features of the routine requiring attention.

Mr. A. Abraham has, aside from aiding Mr. Fee in his multifarious duties, been employed in bottling such products as we have disbursed, other than anthrax and black-leg vaccines, and has proved careful in this work.

BIOLOGICAL PRODUCTS.

We have conducted, through the year, the manufacture of the various biological products hereunder noted. As formerly, their disbursement has been through your office, and at times their preparation and packing has been a severe tax upon the small staff of the laboratory. Each product has presented its own problems, and we present herewith a statement indicating the disbursements during the year:—

	Mallein.	Tuberculin.	Tuberculin Precipitated.	Strangles Vaccine.	Stock Bacterial.	Normal Horse Serum.	Black-leg Vaccine.	Anthrax Vaccine.	Outfits.	Needles.
1914.										
April.....	1,000						4,390	100	3	7,113
May.....							7,515		1	
June.....	3,000						9,465	1,160		
July.....	2,000	2,000					7,280			
August.....	2,500	2,000		2,072			4,100			
September....	7,000			2,525	5,050	1,500	5,102		1	
October.....		2,000		100	100		9,260			
November....			227				4,700			
December....	4,000	2,000	250	15,000			12			
1915.										
January.....	2,000		200	200			5,212			
February.....	2,000	2,000		7,200			8,800			
March.....	2,000	2,000	15	1,000			10,200			
	25,500	12,000	692	28,097	5,150	1,500	76,096	1,260	5	7,113

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The most important addition to our disbursements in the foregoing table is noted under "Strangles vaccine." The requirements in this connection have been almost exclusively for military purposes in connection with the Canadian Expeditionary Force. The use of this vaccine has been followed by satisfactory results.

ABORTION.

Dr. Evans had this work in hand up to the time of his departure, and since that time it has been in the charge of Dr. Reid. Dr. Reid has conducted a large number of advanced experiments, the object of which has been the immunization of cattle with a view to preventing further losses in treated animals. This work promises satisfactory results, but will naturally have to be conducted on a much larger scale than has been possible up to the present time before a definite decision can be reached concerning its value. Efforts are being made to secure the necessary animals for these experiments, and I trust that they will shortly be available.

Dr. Reid visited the Trappist monastery at Oka on January 18 last with a view of assisting them in finding the cause of losses experienced from abortion in a number of their cattle. He found that the losses in question were due to the presence of the infective agent of contagious abortion in their herd, and, at their request has carried out, with a number of their cattle, experiments having in view their protective immunization against this affection.

JAPONIZING OF TURKEYS.

We may mention that during the year, in addition to the work upon enterohepatitis, we caponized four of the male poults with the result that we can now state that the operation is easily performed and followed by a satisfactory growth thereafter. The flesh of the bird is greatly improved, and I think that it can safely be said that a turkey capon is fully as far ahead of the ordinary turkey as the capon is superior to the unsexed chicken. Further experiments in this connection are desirable, and as our experiments progress we hope more birds will be available for this purpose.

DISINFECTANTS.

During the year our studies have been continued on the germicidal action of a number of disinfecting fluids. This work, while occupying a considerable amount of time, is of such a nature that more attention could profitably be spent upon its laboratory problems.

We have at various times tested disinfectants in accordance with each of the several methods that have been published during the past twenty years, but for the work now in hand we use the method recommended by the Hygienic Laboratory.* We use the special sterilizing device suggested by the Lancet Commission, and have found this more satisfactory in the sterilization of the platinum needles than the wooden block specified by the Hygienic Laboratory method. We offer nothing of an original character regarding the conduct of the test at this time, but in order to give credit to those whose work has enabled the perfecting of the method, quote the authors, Messrs. Anderson and McClintic, of the bulletin in question as follows:—

"In proposing this method we desire to make full acknowledgment of our use of the Rideal-Walker and the Lancet methods, especially the latter, as a basis for our work."

* Bulletin No. 82, April, 1912, Hygienic Laboratory, John F. Anderson; Thos. B. McClintic Public Health and Marine Hospital Service of the United States.

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It is quite evident that in the development of any particular laboratory technique many factors enter which to the uninitiated are scarcely understood. The testing of disinfectants offers no exception to this rule, and the present method of the Hygienic Laboratory is undoubtedly the best that has been presented.

A large number of samples have been forwarded from your office with the request that we provide you with a statement of their phenol coefficients. This work has been carried out as requested, and from our findings it is evident that the whole problem of the control of disinfecting materials will require closer supervision than has heretofore been the case. This is in accord with the views presented in my reports of some years ago, but action seems more urgent than formerly owing to the increased value of phenol as an ingredient used in the manufacture of high explosives. We are not ready to make definite recommendations at this time, believing that more experience with some of the commercial products is necessary.

DOURINE.

On August 25, 1914, Dr. Wickware visited Smith's Falls for the purpose of investigating a suspected outbreak of dourine, and his findings in connection therewith were wholly negative.

On October 14 last, Dr. Evans visited Sherbrooke for the purpose of investigating a suspected outbreak of dourine. The history in this case indicated that the animal responsible came from Alberta, and the suspicion that dourine existed was subsequently confirmed. Dr. Wickware visited the same locality in November for the purpose of completing, in Dr. Evans' absence on active service, the measures necessary to control and eliminate this outbreak.

ENTERO-HEPATITIS.

We have, as during the past few years, conducted experiments with this affection. Fairly satisfactory progress has been made, but on account of accidents during the incubation of our eggs at the Poultry Division of the Experimental Farms Branch, the results were not as satisfactory as was anticipated at the beginning of the season. A bulletin was issued during the year as Bulletin No. 17 (Enterio-Hepatitis) of the Health of Animals Series.

FOXES.

Early in the year you complied with the request of Premier Mathieson, of Prince Edward Island, and permitted me to make an investigation in connection with the losses experienced by fox ranchers upon Prince Edward Island. The first-hand knowledge secured during my short stay on the island made it possible for me to arrive at certain conclusions and, apart from the assistance I was able to render in connection with infectious diseases, I was also able to offer advice in connection with the general care and feeding of the young foxes. My full report is presented as a supplement to this report. (Supplement No. 1.)

POULTRY.

The necessity for fuller investigation into the losses experienced, not only by poultry fanciers but by farmers, is more urgent than ever. Many losses we have found to result from infection with tuberculosis, many from enterio-hepatitis (turkeys), others from intestinal parasites, and many die from improper methods of feeding. The time which we are able to spend upon the various poultry disorders is limited, and has to be undertaken as our time permits. We believe that there is a sufficient field in this poultry work to continuously occupy the time of a single investigator, and we regret that the staff of the laboratory has not permitted our taking up a few of the many subjects more completely than has been possible.

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The abnormalities presented at autopsies which are the result of purely anatomical deformities would seem to us to require an investigation with a view of so guiding breeders of high-class poultry that their matings may be made with a view to avoiding this difficulty.

If it is possible to take up this work in co-operation with the Poultry Division of the Experimental Farms Branch, I believe we could anticipate making very satisfactory progress provided the full time of one investigator was available at the laboratory. Our records show the increasing necessity of microscopic examinations and a full study of disorders before satisfactory advice can be given. At the present time we are unable to devote the time which this feature of our work seems to demand. The shortage of meat food products, the cost of feed, and the increasing numbers of people interested in poultry seem to us to indicate that greater assistance than we are able to offer is very desirable at this time.

Tapeworms in Poultry.—In view of the foregoing the following observations may be of interest. Repeated examinations of fowls at the laboratory indicate that tapeworm infestations are becoming more common or else are more readily recognized than has been the case heretofore. In addition to the larger tapeworms, microscopic tapeworms, first seen at the laboratory by Dr. A. B. Wickware, have been found with increasing regularity, and in every instance coming to our notice have been the cause of much loss, the result of unthriftiness and deaths in the flock. When these parasites are present in great numbers we have found that the intestines are the seat of an intense catarrhal enteritis in which the mucous membrane is severely eroded. Tapeworms, in addition, seem to throw an immense amount of work upon the gizzard, evidenced by the severe ulcerations in its mucous membrane. These ulcerations may be partly the result of a toxic principle secreted by the tapeworms. This feature we have been unable to investigate in a manner suggesting itself to us as insufficient time has been available for this purpose. We have also noted in these tapeworm infestations an enlargement of the glandular areas just within the opening from the caeca into the intestines. This enlargement and engorgement of these glandular areas is frequently seen in digestive disturbances, but is invariably present in verminous infestations. We have been able in the majority of cases to advise treatment that has been followed by good results. We know practically nothing, however, of the life-history of the various intestinal parasites outside the body of the fowls.

We have also observed a long slender microscopic round worm in a large number of cases either with or without other verminous infestations, round worms, large tapeworms, or the microscopic tapeworms. We are unable to contribute any data relative to the source of origin or to means which will assist in their absolute prevention. Further experimental data are required if our greatest service to the poultry industry is to be realized.

TUBERCULOSIS.

The experimental work with tuberculosis has included the testing of tuberculin prepared at the laboratory, and in this connection I may be permitted to point out that tuberculin prepared and tested at the laboratory, and subsequently tested in a larger scale at the packing houses has given satisfactory results.

We have in progress experiments upon cattle connected with the point of infection and its relationship to the channels of infection through the system of individual animals. Full details of this cannot at present be given, but we hope that progress may be made during the coming year, when a portion of this study will be completed.

Tuberculosis of poultry is more frequently observed than formerly. During the year a special bulletin was prepared by Dr. Wickware and myself and published as Bulletin No. 18 of the Health of Animals Branch series. This bulletin while of undoubted value to poultrymen, has no doubt enabled many to make their own

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diagnosis. No suggestion can be made by me as to the prevalence of tuberculosis among poultry, there being no means of securing accurate statistics. It is my opinion, however, that the disease is far more prevalent than is desirable.

WATER EXAMINATIONS.

Routine water examinations have, as formerly, been conducted at intervals to determine the efficiency of the special sterilizing machines in the various government buildings. We are still able to report that water known to have passed through one of these machines has never shown evidence of sewage infection. •

The foregoing is respectfully submitted.

I have the honour to be, sir,

Your obedient servant,

CHAS. H. HIGGINS,

Pathologist.

SESSIONAL PAPER No. 15b

(Supplement No. 1, to Report of the Pathologist.)

THE CARE, SANITATION AND FEEDING OF FOXES IN CAPTIVITY.

INTRODUCTION.

Within a very few years the rearing of foxes in captivity has attracted more than ordinary attention. The very high value attached to pelts of exceptional quality naturally resulted in those who had been supplying the higher grades attempting to rear those wily animals under artificial conditions. For some years this was practically a secret industry, but the ever-increasing price of pelts led to offers being made for live animals with a view to using them for breeding purposes. From a very moderate figure the price has gradually increased, and now many of the choicest animals are capitalized at from fifteen to thirty thousand dollars per pair, with very few available.

It is natural that the maintenance of such valuable animals in captivity has, as in other lines of endeavour, presented its problems of care, sanitation, and feeding, which, in some instances at least, have been disastrous. Breeders are alive to the fact that there is no royal road to wealth in this industry; nevertheless, the returns have been great and progress has been made as new facts have been secured to reduce the hazard.

The purpose of this compilation is not to supply information which will prevent all future losses, but to point out some of the fundamental principles, the observance of which will, in a measure at least, assist in a fuller understanding regarding the problems confronting those now engaged in, or about to engage in, the business.

As a general consideration it is taken for granted that the keeper has had experience in the care of foxes under artificial conditions, is a keen observer and is possessed of sound judgment in their handling and management. He should be a person of unimpeachable integrity, for otherwise there will be difficulty in learning of leaks should such unfortunately occur. The utmost care should consequently be exercised in his selection, or serious failure may be anticipated at the outset.

While many consider that luck plays an important part in the financial success of fox farming, I believe that it is but a minor factor, and that a thorough knowledge of the animal, its vagaries at various seasons of the year, coupled with an understanding of methods of feeding and sanitation are the factors which will with greater surety lead to success.

In discussing the whole subject, I will endeavour to take up the various features under different headings in order that those desiring to consult this small treatise may do so with the least possible difficulty.

I may here acknowledge my indebtedness to the Veterinary Director General, Dr. Fred. Torrance, my chief, who detailed me to the investigation of this industry, to Premier Mathieson, through whose instrumentality I was permitted to visit Prince Edward Island, to Mr. Fred. L. Rogers, president of the Fox Breeder's Association, to Dr. W. H. Pethick, the inspector in charge of the Health of Animals Branch for Prince Edward Island, and to the many breeders, keepers, and investors who in every instance afforded me the opportunity to learn of their methods, their successes, and their failures. Without this assistance my mission would have been fruitless and the data for this compilation could not have been secured.

II.—SELECTION OF STOCK.

In the selection of stock for the breeding of any species of animals, the greatest care must be exercised, or serious financial loss and disappointment will follow. This is probably of greater import in the farming of foxes for profit than in the rearing of any other class of live stock. Many reasons exist for this, the principal being that the fur of the silver fox has from time immemorial been the fur of Royalty. The exploration and sentiment of those remote corners of the earth inhabited by the fur-bearing animals has progressed, till now the securing of fox pelts is presenting greater difficulties each year, and, furthermore, the difficulty of rearing these animals in captivity has presented insurmountable barriers.

The animals mature rapidly, and the returns have reached a figure which in many instances has placed poor farmers in affluent circumstances within a very short period.

If possible it is preferable to secure breeders from what is termed pure-bred stock, or stock that is known to be capable of reproducing its kind without a reversion of type. At the same time it must be borne in mind that the pelt value is the ultimate basis upon which the industry rests, and the only one to be considered when selecting the stock. In judging of the pelt value in breeding stock, another consideration enters, namely, the conformation and stamina of the individual, for without perfect conformation, deformities will be encountered in the progeny, and without a very high stamina, the progeny will be weaklings and succumb early in life, losing to their owner not only the pelt value and the individual but the profits which would otherwise accrue from such as future breeders. These considerations are paramount and will save much subsequent annoyance if thoroughly weighed at the outset.

Having borne in mind the foregoing considerations, the breeding of the progenitors of the stock selected should, in so far as it is practicable, be known as far back as it is possible to go. This ensures the fixity of the type and thus eliminates the danger of a recessive or sport* appearing in the progeny. Such recession not only has a tendency to depreciate the value of a given litter but the possibility of its recurrence in such a breeder's progeny is ever present. It is thus apparent that where the type is fixed, and it is known that the chances of a recessive or sport occurring are remote, the value of the pair and the progeny as breeders is greatly enhanced.

This also brings in for serious consideration the probabilities that may be expected from the introduction of silver, black, patch, or cross foxes for breeders. At the present time little or nothing is definitely known concerning this. Many hold that a fox is a fox regardless of colour or place of origin and that it may be mated in any manner without danger. Others, again, hold that nature has bred foxes of different varieties, each true to type, such as the Alaska blue, the Northwest black, the cross, the red, and the grey; that these types are fixed, and while in the first generation they may freely interbreed, this progeny being hybrids will be sterile or very nearly so. We get hybrids among equines by crossing the Jack and the mare or the stallion and the Jennet, yet these cannot be bred further. Among birds we know that domestic and wild geese cross, and while this cross results in the finest table bird known it does not go further, as the hybrids are sterile. Upon this basis it is argued that the various breeds of foxes have been fixed by some fundamental law of nature, and that these laws cannot be controverted by man's desire to secure valuable fox pelts, excepting along certain given lines which future experience alone will determine.

These considerations possess a definite cash value in any breeding proposition, and must be considered in the organization and development of strains of breeding

* A recessive or sport in breeding is the offspring of an animal whose characteristics, either colour makings or conformation, revert to some ancestor, male or female. This recessive characteristic may skip a number of generations before presenting itself.

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stock. Experience and experiments will doubtless determine the value of the considerations outlined, and therefore every breeder of foxes should keep an accurate record of all his stock from the first start in order that the whole may be compiled for the collective benefit of the industry. Such accurate facts will ensure the confidence of the investors, and will also prove of value in pre-determining the price which can safely be paid for a male or female with certain breeding.

III.—LOCATION OF A FOX RANCH.

Many ideas prevail as to the best location of a ranch. It is, however, conceded that it should be on high, dry ground. The soil should be sandy and free from alkali if the best pelts are to be secured. Sales have shown that the most valuable pelts have been supplied from Prince Edward Island, and it is fair to assume that the climate and the soil are here eminently suited for the exploitation of the industry.

Various experienced breeders have considered it necessary to provide shade, and consequently the majority have located their ranches in a bush composed of spruce, birch, and poplar. One of the main arguments for such a location is, that foxes in the wild select a similar breeding place. It is said to be detrimental to the fur if too much sun is permitted in the ranch, thereby causing a fading of the gloss, sheen, and other fine points which are factors in judging the value of a given pelt. Observation, however, shows that both the old and young foxes differ in regard to their desire to sun themselves. Some will lie for hours in the sun, moving every time they become shaded, while others will act just the opposite. These habits will doubtless vary greatly with the different seasons, but from these considerations it would seem desirable to supply both shade and sunlight in every pen of the ranch in order that each individual fox may satisfy his own desires in this regard. It having been pre-determined what animals are to be used for pelt production, these individuals can be shaded or otherwise treated with this end in view.

It may prove of advantage to locate the ranch at the edge of a bush, so arranging the individual pens that each may have a shaded and a clear space.

A ranch should not be too close to a settlement, for various considerations. First, the foxes should be kept free from unnecessary disturbance; and second, the foxes themselves are at times quite noisy. Furthermore, a peculiar odour is given off at all times, this being more particularly noticeable during the breeding season. With a ranch near a settlement, not only would there be many visitors, but the dangers of introducing disease through the agency of stray dogs, which cannot be controlled, is greater than would be the case when isolation is a feature.

It is possible that circumstances will necessitate a certain location being decided upon, in which event every care should be exercised to make the location satisfactory from every point of view.

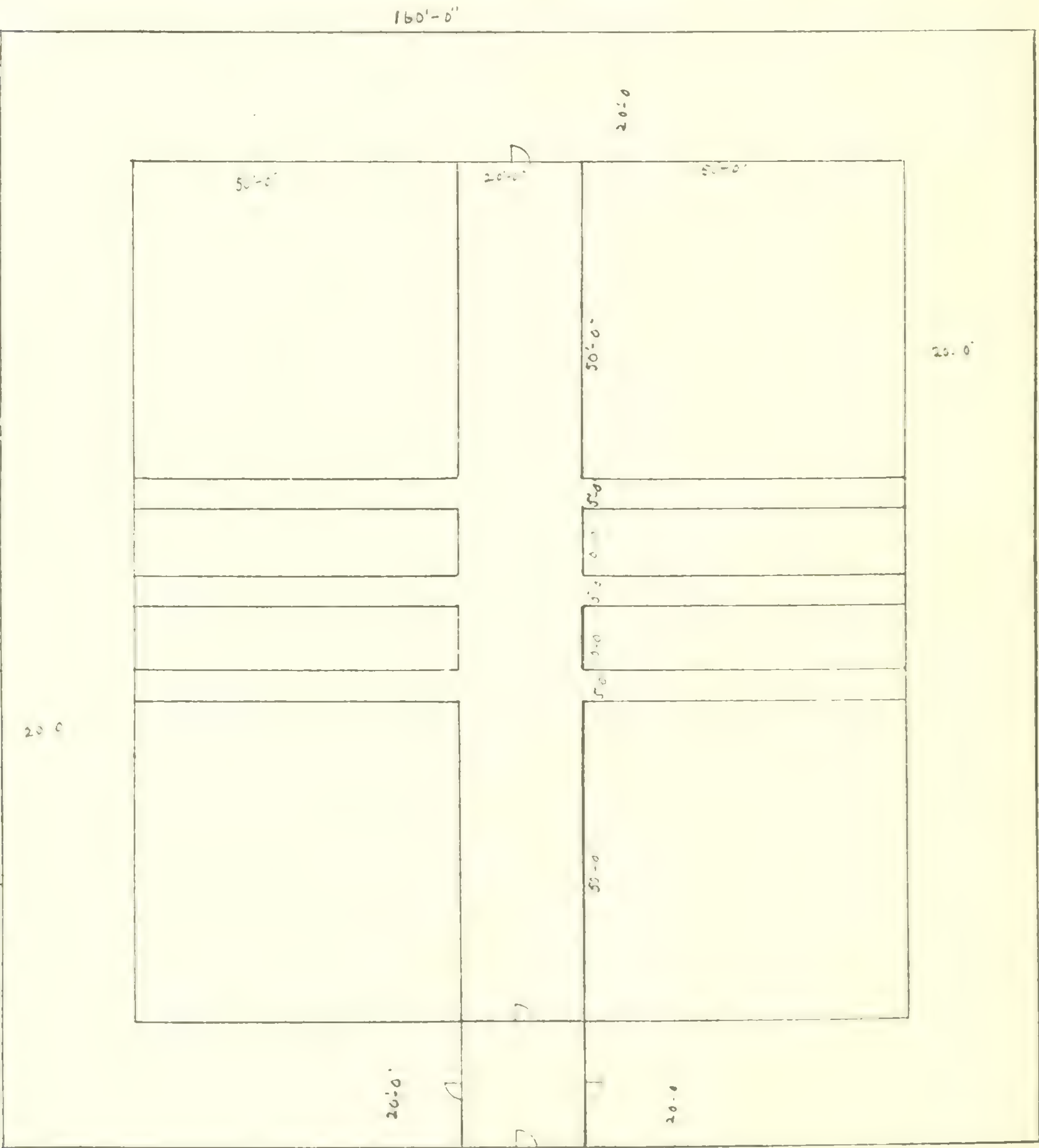
IV.—CONSTRUCTION OF A FOX RANCH.

As at present constructed, many types are to be observed. All of these various types have their strong points, yet their weak features are as apparent to the trained observer. I shall not enter into the various considerations which prevail for any given type of construction, but will outline certain features which I believe should be embodied, having a view to the maintenance of health and their protection from infectious or contagious disease. To me the maintenance of health and the protection from infectious or contagious disease are among the most important considerations affecting the fox industry to-day.

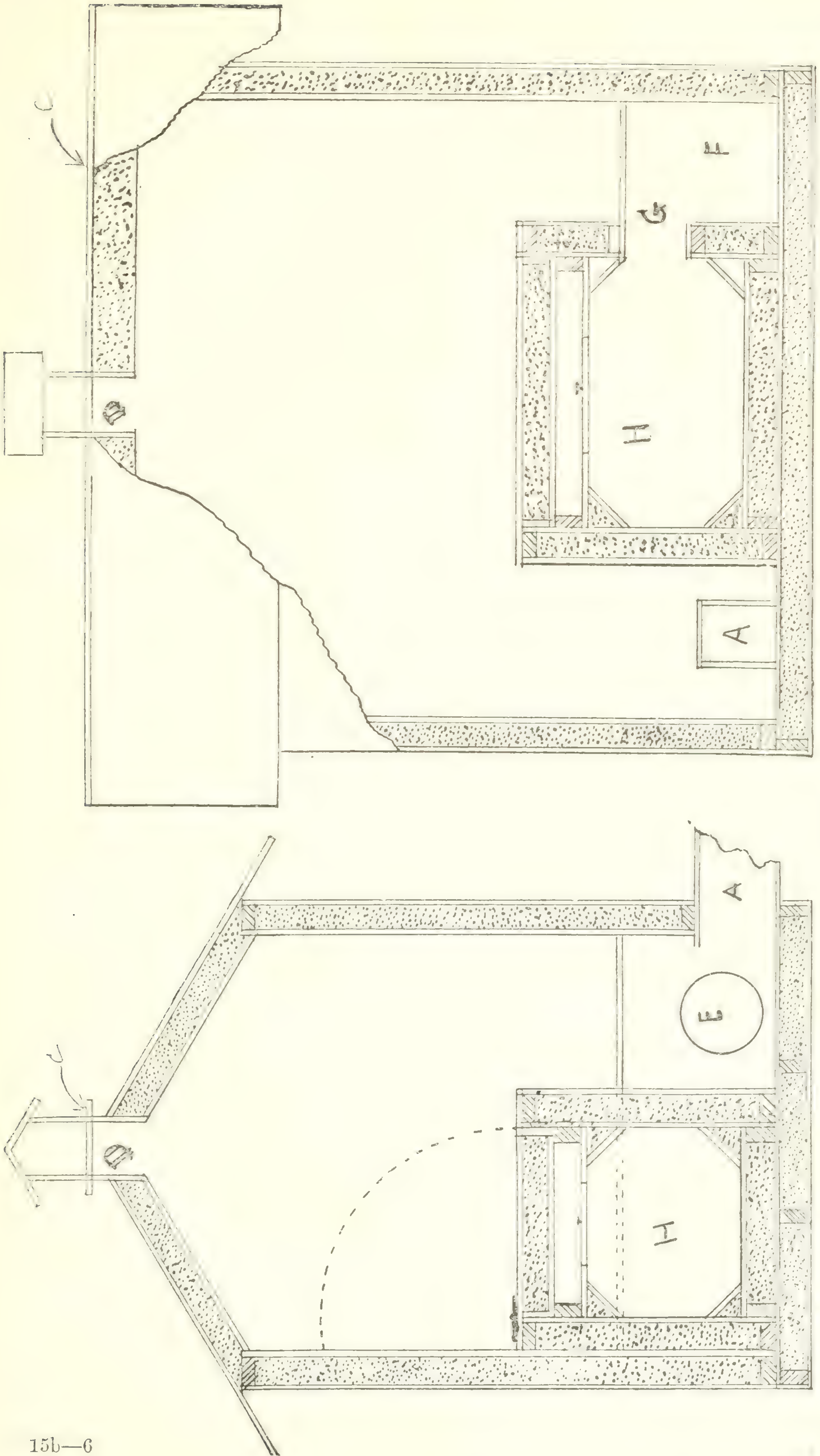
From an examination of some of the best fox ranches, and discussing the matter with the best breeders, it seems highly desirable to provide an area of approximately

2,500 square feet for each pair of foxes. Much less is observed in some of the successful ranches, while very few have a greater area.

As each pair is provided with a separate pen, and it has been the general practice to so construct the ranch that the least possible area will be covered, pens are placed close to each other. This provides the accommodation within the smallest possible enclosure, yet it is apparent to me that in the event of any epizootic disease gaining entrance to the ranch this supplies the best possible means for its communication from one breeding pen to the other. Some safeguard in this respect should be provided, and this can be included in the construction of a new ranch, but cannot with such ease be incorporated in existing ranches without a great deal of difficulty, or practically the rebuilding of the whole ranch. Probably the best safeguard will be the inclusion of a dead line of not less than five feet in width between each pen, and a general construction such as is shown in the plan given hereunder.



Ground floor plan of fox ranch, showing arrangement of pens.



Cross section drawing of building containing fox den.

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Many methods of working out the various details are observed in connection with the various ranches, some of which require considerable forethought. Some definite experimental work should, I believe, be undertaken in the line of ranch construction, at the same time having due regard for the peculiarities of the animal with which we are dealing, and the sanitary and other requirements which must be observed if the best results are to be secured.

I have noted that the general practice is to place the shelter containing the den within the enclosure of the vixen's breeding pen. I believe this to be sound practice, for there is no doubt in my mind that the majority of the vixen's have sufficient reasoning power and sense of location to know when they can get easily around the entire outside of this shelter. Where this shelter is placed outside of the vixen's breeding pen it is but natural to believe that some uneasiness is occasioned from this source.

V.—PROTECTION OF THE RANCH.

As has already been mentioned, a special guard fence is constructed from 20 to 40 feet outside the fox pens, and this will hold the foxes should one accidentally escape from its individual pen.

A provincial statute exists in Prince Edward Island making it a penal offence for any one to come inside the outer fence of the premises without permission. Such legislation, while very necessary, would not deter any one endeavouring to secure entrance for ulterior purposes; consequently, it is advisable to provide other protective measures. In quite a few ranches dogs are employed, but in the opinion of the various keepers their value is questionable. As there is a natural antipathy existing between the dog and the fox, which has been fostered for generations, the holding of dogs in or near a ranch for any purpose would seem to be an unwise procedure. Every effort should be exercised toward having the foxes as contented as their captive condition will permit. It might not be amiss for me to here offer the opinion that I consider it decidedly unwise to hold any animals other than foxes captive for any purpose in the immediate vicinity of any fox ranch, unless it is positively known that such an animal is the natural prey of the fox in nature. I have observed tame bears, skunks, and raccoons quartered close to breeding pens, and while no direct evidence exists that their presence had any effect upon the breeding foxes, it seems to me a bad business policy to assume an unknown risk when such a great hazard is involved.

Furthermore, on a strict sanitary basis the feeder, keeper, or manager of foxes in captivity should not come in contact with any other animals, either wild, captive, or domestic, as he would be quite likely to carry the odour on his hands and clothing, and this doubtless would exert an effect very nearly if not quite as hazardous as the presence of the animal itself. It is a fact that wild animals are possessed of instincts unknown to men, and likewise, some of their senses are of a much higher order than those of the human being. The fox is no exception, and, in common with the carnivora the sense of smell is relied upon to detect the presence of enemies and friends. It is on account of the very high development of the nose of the fox that I have laid so much stress upon the elimination of any factor which will in any manner interfere with the contentment of the fox under captive conditions.

Not only is there danger of conveying fear through the actual presence of wild animals or the transmission of their odours through some intermediate article or individual, there is also the ever present danger of transmitting epizootic disease; either of which may result in an alarming financial loss within a very short period. These considerations cannot be ignored nor overlooked by individuals interested in the fostering of the industry.

To revert to the methods of protection from the purely police point of view, where the main desire is to prevent the stealing of animals, ordinary precautions such as may be taken in other industries are resorted to. Locks of various sorts and descrip-

tions have from time immemorial provided a means of safeguarding private and public property. They likewise provide a means of detaining the curious and any but the maliciously inclined. The use of dogs for the purpose has already been commented upon, and these animals should be eliminated for sanitary and other reasons.

The use of watchmen for the patrolling of the premises is a necessity that cannot be dispensed with. A single watchman, however, does not fulfil the entire requirements demanded for perfect safety, and various devices will suggest themselves as time progresses, the result being that constant evolutionary changes will occur as the knowledge of the fox increases.

I have suggested to a number of ranchers that goats, while performing certain police duties, would also provide the best nutriment with which the young foxes could be supplied, namely, goats' milk properly modified. I do not believe that the male goat would offer a hazard, yet I know that he would successfully cope with intruders. It may be feasible to allow a few goats to roam at will outside the ranch, but within the guard fence. They would keep down the grass and underbrush, thus materially reducing the fire hazard, which in some instances is a very serious menace, and, at the same time perform a valuable police duty. Furthermore, they would, providing the proper breed is selected, give a fair revenue on the money invested.

VI.—MATING OF FOXES.

The proper mating of foxes is probably one of the most vital considerations connected with the ultimate status of the industry. Some of the breeders with the largest experience have so mated their foxes that pelts of an exceedingly high value have been secured. With those who have had less experience the mating seems to be a matter of greater or less chance.

There is no doubt in my mind but that the ranching of foxes in captivity will ultimately be placed upon a pelt-value basis, and will not remain for any extended period upon its present breeding-stock basis. The pelt value being the one upon which it must ultimately rest, demands that such steps as are necessary be taken to arrive at this point with the least possible delay. In the breeding of other animals, either wild or domestic, certain points have ever been uppermost and necessary to attain. So in the ranching of foxes for their fur, the quality and texture must necessarily be the basis upon which the business is to be continued. With this end in view, matings must be made to produce the quality and texture demanded by expert furriers who are in direct touch with the sales end of the fur business. This will doubtless vary from time to time, but until the basic factors underlying the business are determined they cannot with certainty be secured.

Probably the most effective method of arranging for the matings would be through the assistance of an expert furrier, who could at the proper season of the year examine the fur on the live animal and thus grade it according to its valuation. With this factor as a known quantity and the assistance of the accepted laws of heredity in breeding, a few years would establish the method that must be followed to arrive at a given result.

As new blood is being introduced through the mating with cross and patch foxes of local origin and the importation of foxes from other localities, factors naturally enter which cannot be ignored. Should such foxes have the texture, lustre, quality, and length of fur required, the following of nature's laws, in so far as they are known, require to be observed to their fullest extent. At the present time it would be very unwise for me to suggest that certain matings may be made with the assurance that certain positive results may be secured. Too many factors enter here, any one of which may upset the most profound calculations. Certain it is, however, that definite laws are laid down which cannot be controverted, and these laws are involved in the production of a given result. These were first outlined by Mendel. It is not my pur-

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pose to enter into a detailed amplification of his views. It will suffice for me to state that Mendel found that by crossing certain varieties of plants he could secure certain results, and consequently evolved definite hypotheses which have since proved to be founded on principles which nature observes with but slight variations.

If experience should prove that some of the foxes introduced are subspecies of the same genus, then we may have excellent results from the fur-bearing viewpoint, but secure hybrid animals which nature has deprived of those reproductive powers by which the species is perpetuated. Should such an hybridizing effect follow with an improvement of the quality of the fur, then one of nature's secrets of producing a requirement of dame fashion will have been unfolded.

In the event of hybridization not occurring, then the goal ahead is the elimination of undesirable qualities and the retention in the animal of those attributes which increase the stamina and reproductive powers of the species, with the concurrent increase in the value of the fur.

The foregoing gives very briefly the more important factors which underly the actual mating process. It is in their final carrying out that the best skill and judgment will be required. As each mating will have to be determined after the careful weighing of all the considerations, no rules are to be laid down, nor can any system be evolved as a result of our present knowledge.

VII.—THE FEEDING OF ADULT FOXES.

The main purpose of food is to sustain life. In the wild, the food of the fox will be found to vary considerably from that provided under artificial conditions. The circumstances under which foxes exist in nature are very different from those obtaining in the artificial environment of the present-day fox ranch. In nature there is the constant fear of molestation, and instinct teaches the fox to bury such food as is not needed for immediate requirements. A similar instinct is observed among foxes in captivity which renders it very difficult to determine the actual amount of food required at varying intervals. In nature, forced exercise is secured in the search for food, while in captivity exercise is largely a matter of individual taste, usually the less-contented foxes securing the greater amount of exercise as a result of its constant movements in an endeavour to secure an avenue of escape. Animals which have become fairly well contented with their surroundings do not worry to such a marked extent and, therefore, do not secure sufficient exercise for their ordinary requirements. It is thus apparent that the amount of food required by each individual animal will vary within certain limits, and these limits cannot well be predetermined.

An examination of the methods in vogue at the various ranches shows that some practise almost an exclusive regimen of meat feeding, while others prefer supplementing this by bread, either ordinary stale white bread or a special bread containing a proportion of bran, crackers or soda biscuits, and milk.

From my conversations with the many breeders, it seems that the best practice is to feed early for the next season's litter, some beginning during the preceding September to build up the vitality of the stock. This appears to have a sound scientific basis, for if the vixen is not properly fed before mating, it is hardly likely that she can readily make up this deficient condition after she has become pregnant and is carrying from four to eight pups. Experience indicates that food is taken very sparingly after the new year. The period of gestation being but fifty-one days, entails a very severe strain on the animal's system, and this is a comparatively short period in which to develop a number of fully formed living animals. Nature is very profligate in its effort to perpetuate a given species, and the fox is no exception to the rule. It is known that from six to eight young in a litter are required to maintain the balance in the perpetuation of the species among the fox tribe. This is due to the chances of insufficient nourishment, the elements, natural enemies, etc. This very factor, a

prolific breeding capacity, has more than any other been responsible for the wonderful returns in the fox industry, as each individual from first-class stock possesses a value of from one to five thousand dollars.

Results indicate the desirability of full feeding from the first of September till the first of January. In this feeding the greatest care should be exercised to ensure the female receiving the required amount of food. Under natural conditions in the wild, instinct calls upon the male to feed the vixen, but in captivity it seems quite probable that a portion of this instinct is lost, with the result that the male becomes more or less greedy, reserving for himself the greater portion of the food. Being the stronger, food that he cannot eat at the time is buried for some future occasion. This being the case the female progresses toward the period when she has to bear young and is improperly nourished for the demands that will be made upon her system.

Those who have had a great deal of practical experience with these animals note a great difference in the disposition of the male with regard to food supplied the pair. With some males the main desire seems to be to see that his mate and her young are well provided with food before partaking anything himself. Instances are recorded where the male quartered in an adjacent pen will actually starve himself in his endeavour to supply his dependents with the food provided him. This instinct will doubtless be found to be very persistent, more particularly among the monogamous males (males mating with but one female) and these will require treatment as special cases. Such monogamous males make the best fathers, and will prove most contented when assisting the female in caring for the young.

Methods must be employed which will ensure the proper nourishment of the vixen. Some practise the expedient of giving the male a piece of meat and driving him away, feeding the vixen within the house and shutting the male out; or, upon occasions surfeiting the male with food which leads to a revulsion and consequent curbing of the appetite. The surfeiting of the male is the overfeeding him on a given occasion to the point of revulsion for food. After such surfeiting his appetite will be curbed in a manner similar to that of a child who had overeaten of candy or any other substance for which they have an overfondness. I make this explanation as some may consider that surfeiting means a continuous overfeeding.

Another method is to supply at all times sufficient food to meet the full demands of the vixen as well as the extraordinary demands of the male, removing such accumulations as may remain in the pen just prior to the freezing of the ground in the fall, and such subsequent accumulations periodically thereafter.

Individual experience and practice will naturally determine the factors which must be observed in the feeding of adult foxes. No definite regimen can be laid down. Variety should be a feature, as the fox is omnivorous. The trained observer who knows the vagaries of the foxes under his care should instantly be able to determine which of the animals he is feeding is gorging itself or, on the other hand, those securing insufficient nourishment.

My point may be illustrated by citing the fact that expert cattle feeders are able to note the least deviation in condition of the animals under their care, and correct this before damage has been done. This applies to cattle fed for either dairy or beef purposes.

Unless the feeder is able to observe departures from the normal, then his usefulness to that particular ranch has come to an end. While I realize the seriousness of changing hands at any season, the man who is unable to work with and for the foxes under his care is a serious hindrance to the industry, and an exceedingly expensive employee.

I believe that the feeder must have a love for his work, have a sympathy for and with the animals, be able to secure their confidence, and furthermore be strictly trustworthy. He must have a knowledge of the various digestive processes in order that he may be able to note any deranged condition, and correct such before any damage

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is done. He should have a general knowledge of health and disease, both of which are desirable in the detection of any ailment. He should have such a knowledge of physiology that he can fully comprehend the changes which take place from the time of conception until the expulsion of the fully formed pups from the uterus of its mother. This knowledge, with an understanding of the composition of the food supplied by the milk of the vixen, and that which must be supplied should anything happen to her, will greatly reduce the hazards now surrounding the industry.

I cannot close the subject of feeding the adult foxes without saying a word regarding the care which should be exercised in the storage and handling of food which is designed to sustain these very valuable animals.

In some instances, not only the method of storing such food materials as are used, but the actual handling seemed to be open for a certain amount of criticism. The foxes are quartered in expensive ranches and guarded with extreme care, yet their food may be held in an inexpensive structure, easily accessible to anyone having ulterior motives. To me it would seem essential that adequate facilities be provided in this regard for the proper preservation and protection of the food supply if untoward results are to be avoided.

VIII—WHELPING.

Probably the whelping of the vixen, or the giving birth to the young, is the most serious consideration connected with the fox industry to-day. If the vixen is able to give birth to vigorous young without accident, and to properly nourish them for the first two months, the greatest dangers are passed. Any accident at this time not only reduces the anticipated profits, but unless its cause is known no remedy can be applied to prevent its recurrence. In no breeding proposition does there seem to be such mystery or fetish as to-day obtains in the fox industry. Some of this may be founded on definite facts, but it seems to me that the major portion is a direct result of superstition or lack of keen observation and experiment.

Accurate knowledge should in my opinion be the foundation stone of progress, and until this is secured very little will be known concerning the whelping and the dangers to be encountered and overcome. Progress can only come by degrees, and in all lines of endeavour is secured by intelligent observation and experiment. Observation seems to be out of the question at the present time, at least, in so far as it can be applied to the vixen at this critical period. Experiment, however, is possible, and many have been performed by various observers. I am advised on good authority that the supposition that the vixen will not under any circumstances permit an observation of the den, or her *sanctum sanctorum*, is erroneous. There are persons, keen observers, who have established such a relationship with the vixens in their care that they can open the den each day without fear of an untoward result. While I would not advise that this be undertaken in an indiscriminate manner, I believe that the feeder should be on such terms with the animals in his care that by a systematic method he will be able to learn of the exact time of whelping and know the condition of the vixen as well as that of the pups. To this end my suggestion would be that the feeder at a given time each day should examine the den and determine its exact condition. It would be far from my object to suggest that this commence only at the period when the offspring were expected, but that it should commence many months in advance of this time with a view to establishing confidence and familiarity. Having established this confidence and familiarity little danger should be anticipated at the whelping period. This, of course, must not be undertaken in an indiscriminate manner, but at the outset may be practised with a very limited number of vixens, and those most adapted for the purpose. It may be considered necessary to keep two or three pairs of red foxes for this purpose, with which the suitability of a keeper could be accurately determined.

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All are familiar with the domestic cat, and no doubt many have observed that this animal in a semi-wild state has its young in a remote place, while the same animal when fully domesticated prefers either the softest bed in the house or a point of vantage behind the kitchen stove. Should the young of the semi-wild cat be found, she will immediately secure a new hiding place and remove her young to it, while the fully domesticated cat, should the young be removed to some outbuilding, makes a strenuous effort to again secure entrance to the house with her entire family. Bearing in mind the methods which may be pursued in fully domesticating the cat, experience will soon teach the best method of procedure with foxes.

Once having ascertained the suitability of a given individual by the foregoing, or any other method, his services should and will command remuneration in accordance with his skill.

I learned of a single vixen that had, under the management of a skilled attendant, given birth to and raised twenty-four pups in four seasons. In another instance, thirteen pairs produced fifty-one pups in a given season, and these animals had during the three years immediately preceding given as satisfactory results. In each instance, the management of the feeder had been skilled and such individuals are of untold value to their employers.

To those whose prejudice will not permit them to open the den of the vixen, I would suggest the placing of a small electric bulb within its confines and having attached thereto such an arrangement (a long tube or other device) that will permit an examination of its contents when the vixen is out. Probably the most satisfactory device would be on the order of what is known in medical circles as a bronchoscope, or an instrument that may, in the hands of an expert, be passed through the mouth and down the windpipe, thus enabling an examination of the interior of this passage. At its lower end is a very small electric bulb which illuminates the entire passage. With the electric bulb a similar device in the den and a sufficiently long tube, its interior could be examined at any time. This would determine the condition of the pups and point out those needing assistance, such as artificial feeding. While suggesting this plan, my experience with complicated mechanical devices leads me to believe it to be impracticable, and in no way to be compared with the daily opening up of the den by an attendant who is on familiar terms with the vixens.

The history of breeding indicates that as progress is made in the improvement of progeny of a given species, greater hazards accompany the climax of the gestation period (parturition) or the giving birth to the young. This having been the case with other species of animals, such steps as will reduce this source of loss to the minimum should be given serious thought. The suggestions I have made are radical, but they have been followed with success by some breeders and, therefore, are worthy of serious consideration.

If my suggestions are carried out, and it is found that the vixen dies during the culmination of her effort to perpetuate the species, prompt intervention may enable the saving of at least a portion of the young. Picture post cards bear mute testimony to the fact that fox pups have been reared on cats as foster mothers. Discussions with various breeders have revealed the fact, that fearing less something was amiss, the den was opened to find the vixen dead with one or more pups living. These hazards should and can be eliminated. Almost without exception those with whom I have discussed the matter are of the same opinion; many, however, are afraid to make a move so radical as I have suggested. It would seem to me that the financial status of the industry would warrant such experiments as would put the question beyond the vale of chance and in the realm of certainty, to be condemned forthwith, or introduced as sound practice. Some modifications would doubtless suggest themselves during such experimentation, and these prove adaptable to the requirements of the business.

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IX. THE FEEDING OF THE PUPS.

There is probably no feature of the fox business that has led to so many losses as the improper feeding of the pups. Their food under natural conditions in the wild, other than the vixen's milk, is in a measure conjectural. The fact that the litters are large indicates that nature has provided for the survival of the fittest and expects the major portion to die ere they reach an age which will permit their breeding. In the ranching of animals it is desired to raise every pup born, and to this end every effort should be directed, it being generally admitted that the present losses are greater than they should be.

From the observations which I have made, the losses appear to be largely confined to the young pups and result from improper feeding or infestation with worms. At this time we are more directly interested in the feeding, but I will consider worm infestation in due course (see chapter XI). It is held that the feeding of the pups must begin some time prior to conception, and at this time naturally concerns the vixen. This feature was discussed when dealing with the feeding of the adult foxes (chapter VII), and needs no further mention at this time. After impregnation, the vixen undergoes that change common to the female of every species, and her temperament may assume a very different character from that observed at any other period. The greatest consideration at this time is to assist in the contentment of the vixen if the offspring are to be vigorous at parturition.

An exclusive meat diet cannot be expected to give the best results, as meat contains but a very small proportion of the bone-forming materials which at this time are very necessary. In my opinion, bones or some adequate substitute must be used if the proper chemical constituents are to be supplied. I believe that a bone mill for the cutting of green bones can with advantage be added to the equipment of a ranch. While offering this opinion, the fact should not be lost sight of that a mechanical advantage accompanies the gnawing of bones that cannot be supplied by any other means, consequently the chemistry of feeding will not entirely supersede other factors, but all must be considered and each given its proper attention.

The diet must be so balanced that the requisite substances will be included which are required for the development of the young, otherwise the vixen will draw from her own reserve in nature's effort to present living young of the highest vitality, even if this result in her ultimate death. As it is desired that the vixen nurse her offspring it is necessary to ever have this in view. The exact food and the method of feeding must be determined according to the supply which may be secured.

After the birth of the pups they need but little attention, as the vixen's milk will supply their wants. At this time, however, as well as during the gestation period, the vixen must be fed for the benefit of her offspring. For this reason the chemical constituents required by the growing pups must be contained in her milk, otherwise untoward results will follow, such as mal-nutrition which may ultimately develop into rickets, and from this into a permanent deformity of the legs. Experiment has proved that the feeding of other species of animals should commence early in the gestation period and be followed throughout along certain definite lines if the best results are to be secured. I believe that the same principles will apply to the fox industry, but, as has already been suggested, this of necessity must be intelligently supervised.

Meat, milk, fish, and eggs, supplemented with a small quantity of whole-wheat bread and ground bone should be used as the basis for the feeding of the vixen. The use of soda biscuits or other crackers has not been uniformly attended with satisfactory results. This may possibly be due to chemicals added during their manufacture, and to the fact that a most valuable constituent of the wheat has been removed in the bran.

When the pups have reached an age at which the vixen's milk must be supplemented, great care should be exercised in the nature of the food supplied to the mother,

as a portion of this will doubtless be offered to the pups. A good practice seems to be the placing of pieces of a coarse home-made bread in milk suitably modified, depending upon the vixen to carry portions of this within the den to the pups. Bran that has been permitted to soak up the blood of a beef carcass, and eggs may be used with advantage, as these supply the very necessary albuminous and proteid materials required by the fox. The adult foxes may be given meat at this time by fastening a bone, from which all of the flesh has not been removed, on an elevated platform. The adults can easily jump to this for their supply, whereas the pups have insufficient strength to do so at this time.

The pups should receive very little if any meat up to eight weeks of age, although some feed meat, fish, and shell fish as early as six weeks. Definite rules cannot be formulated with our present knowledge, but much can be done to overcome the difficulties now experienced if the foregoing suggestions are considered by an intelligent and careful feeder.

Digestive disorders will occur even under the most experienced guidance and their early recognition will avoid many losses. A deranged digestion either indicates a diseased condition arising from some outside cause or the supplying of an improper dietary regimen. The majority of these disorders will fall within the latter category.

When the digestion is deranged as the result of an improper diet, the cause must be removed immediately and the animal fasted. With this fasting a gentle purgative may prove beneficial. In resuming the diet, properly modified milk (see chapter X) to which has been added a proportion of the white or yolk of egg should be fed sparingly. Should no untoward result follow this, then the full ration may gradually be resumed, but in doing so the article responsible for the trouble should be eliminated or reduced in quantity.

X.—THE ARTIFICIAL FEEDING OF FOX PUPS.

In the artificial feeding of fox pups, I particularly refer to cases where the vixen, either through death or other accident is unable to care for her offspring. With our present knowledge, this is a very difficult proposition but must be approached cautiously with the data now in our possession.

Through the kindness of Dr. A. A. Black, of Summerside, I was provided with a very small sample of fox milk, and I am indebted to Dr. F. T. Shutt, Dominion chemist, for an analysis of this. A further study of fox milk should be undertaken as the present data can only be considered as provisional until we can supplement it with other analyses. (For such an analysis at least an ounce of milk should be available.) That the single analysis which we have may be compared with other analyses I present herewith a table giving data secured from the milk of a number of species of animals.

	Human.			Dog.	Fox.	Cat.	Rabbit.	Guinea-pig.	Sow.	Elephant.	Horse.	Ass.	Cow.	Goat.	Sheep.
	I	II	III												
Casein . . . . .	...	...	...	5.1	3.08	3.1	...	...	...	...	1.2	0.7	3.0	3.2	5.0
Albumen . . . . .	...	0.5	...	1.6		6.4	...	...	...	...	0.8	1.6	0.5	1.1	1.6
Total proteid	1.7	1.7	1.7	7.1	...	9.5	15.5	11.2	5.9	3.1	2.0	2.2	3.5	4.3	6.5
Fat	3.1	3.8	3.3	12.5	21.92	3.3	10.5	15.8	6.9	19.0	1.2	1.6	3.7	4.8	6.9
Sugar	5.4	6.0	6.6	3.5	0.54	4.9	2.0	1.3	3.8	8.8	5.7	6.0	4.9	4.5	4.9
Ash	0.2	0.2	0.3	1.3		0.6	2.6	0.6	1.1	0.7	0.4	0.5	0.7	0.8	0.9

From this table it will be observed that the fat content in fox milk is extremely high, and I may here mention that the proteid could not be determined in the sample

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at hand, while the casein and albumen could not be estimated separately. Basing my suggestions upon the analysis as given, and assuming the proteid content to be in the neighbourhood of eight per cent, or somewhere between that of the dog and the cat, a formula for the modification of goat's or cow's milk would be as follows:—

<i>Formula for Modified Milk.</i>		Ounces.
Fresh unsalted butter...	...	1½
Proteid (supplied by the use of clear beef broth free from fat or sediment)...	...	1
Goats milk—whole...	...	2
(In lieu of goat's milk, 1½ ounces of whole cow's milk may be used).		
Lime-water and barley-water in equal proportions, sufficient to make a total of...	...	8

This may be fed to the pups, either with a spoon or through a nursing bottle, some of which are specially made for use with pups. For very young pups, one-half an ounce should be sufficient every three hours. Should this formula not be well tolerated, reduce its strength by increasing the amount of barley-water, making the whole up to 10 ounces. As the pup increases in size and weight, reduce both the lime- and barley-waters, and in lieu of the reduction add its equivalent in egg, beating the white and the yolk together before adding. The quantity of this modification will naturally have to be increased with the growth of the pups. The gradual increase in its strength, while reducing its liquid bulk, gives the added nourishment required without unduly distending the stomach of the small animal.

When the pups are able to lap this up, other constituents such as coarse home-made bread prepared with bran, cornmeal, milk, and beef drippings may be added, sparingly at first and gradually increasing the amount, carefully watching for any untoward result. As the fox pup becomes stronger both the lime-water and barley-water may be eliminated and the diet supplemented by eggs and later by meat and other materials such as are used for the adults.

Indigestion, manifested either by constipation or diarrhœa must be noted and the formula varied to overcome either condition. When constipation is noted this can doubtless be corrected by slightly increasing the amount of whole milk added. With diarrhœa the increasing of the lime-water and barley water will doubtless be followed by the desired result.

It will be noted that I have given preference to goat's milk, and my reason for this is the more easy assimilation of the fat of this milk and the butter-fat in the presence of the curd of goat's milk. If cow's milk must be used it should not be from Jersey's or Guernsey's, as the milk of either breed, owing to the large size of the fat globules, forms a solid curd upon coming into contact with the acid of the stomach, and thus the digestive processes are retarded. When goat's milk coagulates in the stomach, a fine granular curd is produced which permits the digestive juices to attack it and successfully prepare it for assimilation. The milk of the Holstein and that of grade cattle have proven to be the best suited for infant feeding, next to that of the goat, and consequently it is assumed that a similar advantage will prove the rule when feeding young foxes.

It may appear that the butter-fat will exert an untoward effect, but from the fact that its natural milk has been removed I believe that but very little trouble will be experienced from this source.

At the outset, artificial feeding will present its difficulties, but a little practice and experience will indicate the pitfalls and ultimately lead to their elimination. I cannot in this very brief résumé give full details to cover the many variations that will be required in actual practice, but believe that the suggestions offered, if intelligently followed, will prevent losses that would otherwise occur.

XI.—THE DISEASES OF THE FOX.

It is not my purpose to enter into a detailed discussion of the diseases of the fox, nor do I intend to dwell upon the methods of combating specific disorders or infections. Such details must be dealt with by individuals specially trained in the diagnosis and treatment of disease who are conversant with the action and uses of drugs. From what I have been able to gather, the fox is subject to disorders peculiar to his species, and also possesses a certain susceptibility to drugs not observed in other varieties of animals. There is more to be learned in this connection, and naturally those veterinarians most intimately associated with the industry are best able to offer advice and deal with disorders at first hand. As our knowledge of their pathology increases as applied to the fox, then the advice which may be given will be of a more exact nature than is at present possible.

I have already pointed out some features worthy of more than passing interest, from the sanitary viewpoint, when dealing with the construction and protection of the ranch (chapters IV and V). As these considerations have been included as a means of preventing disease, it will be timely for me to mention some of the infectious diseases that have already occurred which will prove a constant menace to the success of the industry.

Internal Parasites.—By internal parasites I particularly refer to such as may occur in the intestines, securing the nutriment for their existence from the food that has been prepared by the digestive functions for the nourishment of its host. Probably the most serious infectious process at present confronting the industry is caused by the *Ascaris mystax*, a round worm peculiar to the fox, infesting the stomach and intestines. It has been my privilege to autopsy two fox pups twenty-six days old, and in each case death resulted from infestation with this parasite. The only means of combatting such an infection is to eliminate it before the pups are born, for to have a worm infestation in the pups we must have worms in the adults, the vixen or the male. The worms maturing within the body of the adult lay their eggs within the intestinal contents, pass out with the excreta, contaminate the mammæ or teats of the vixen, to be taken into the stomach of the new-born pup with his first nourishment. These worms may attain a length of from one and a half to eight inches. The treatment of little pups is a very hazardous procedure, and may be as disastrous as the parasite it is desired to combat. Treatment, however, is indicated even in the small pups, but with such valuable animals as the silver black foxes, I believe that an examination should be made of the excreta of each adult in September, and if the eggs of this parasite are present, adequate treatment should be undertaken for their elimination, and reinfection prevented. This means some expense, but by the saving of a single pup it would prove an economical investment.

Not only may this worm be present, but there may also be any one of a number of varieties of similar parasites. The *Ascaris mystax* is mentioned as it is the most commonly met with. Some of the others are more difficult to combat, yet all may be eliminated providing the proper measures are followed under trained supervision.

Tapeworms have been found in Canadian foxes, and have caused the death of a number of animals. Of the tapeworms infesting the fox there are nine varieties which have been described. Each of these nine has its own characteristic life-history and a host from which the fox may become infested. A tapeworm is found as such in the intestine of its host, in this instance it is the fox, where it grows by absorbing the partially digested food contained therein. The tapeworm is always provided with suckers, and in some instances with small hooklets for attaching itself in the most favourable portion of the intestine or where the food supply is most suitable. After attaining a certain development the mature segments are fertilized, break away from the head portion and pass out with the excreta. Upon being voided by the animal the eggs contained in the segment are liberated, and if moistened for a few days become

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fully developed, from each of which emerge a small water parasite. This small water parasite disports itself until ready for its new host, a species of water snail, making directly for its liver, and there securing itself. A certain further development takes place in this liver tissue and when completed the snail crawls up a blade of grass to sun itself. The parasite now emerges, attaches itself to the grass and forms a protective covering of lime about itself. Here it awaits a new host which in one instance is the rabbit. The rabbit eats the grass, the lime covering is dissolved from the parasite in the stomach and the parasite burrows through the tissues of its new host until it finds a suitable resting place, where, at the expense of this host it envelopes itself in a watery bag to await the arrival of a fox to devour the rabbit and thus gain entrance to the intestine, where havoc is again wrought. This, then, is a hurried sketch of the various stages of development which this parasite must undergo.

With a knowledge of the means by which the above types of parasites develop and infest the foxes, we are prepared to undertake such precautions as will prevent their causing trouble and financial loss to the industry.

Not only are there intestinal parasites which invade the fox, but a fluke which invades the liver has also been found. How dangerous this may prove is at present an unknown factor which future investigation alone can reveal.

External Parasites.—There are parasites which inhabit the external portions of the body, such as lice and fleas, but the most serious is the mange parasite which burrows into the skin. Mange has occurred among foxes, and great care should be exercised in preventing its introduction. Its treatment has presented extreme difficulties, and in many instances is of little avail. As the fox is so different from other animals its treatment must be undertaken by skilled direction.

Febrile Infectious Diseases.—Under this heading will be classed those disorders which are manifested by a rise in the body temperature. There is no doubt but that the fox is susceptible to many disorders of an infectious nature accompanied by fever. Their classification, however, at the present time is out of the question, and I will consider only distemper.

Distemper, similar to that occurring among dogs and cats, has occurred among foxes and is an ever-present menace. With distemper, as with the other disorders of an infectious nature, skilled treatment based upon the symptoms presented must be at hand, and each case dealt with as it occurs. My view here is, that this, as well as all of the other infectious diseases, are best dealt with before they gain access to the ranch. Once they have occurred, each instance must receive individual treatment, as so many variations from the classical type are observed.

Non-Febrile Infectious Diseases.—Very few non-febrile infectious diseases are observed in the fox, other than the parasitic infestations which have already been dealt with. One infection, rabies or hydrophobia, is common to all known animals and to man. On account of the danger of infecting man from the bite of a rabid animal, it is highly desirable that it should be here recorded as an affection which may infect the fox.

Rabies is an infection that can be passed only by the bite of a rabid animal. How much danger there is of this becoming epizootic among captive foxes is unknown, but to be transmitted one fox must be bitten by some rabid animal or a rabid fox, hence the ranch construction should be such as to provide against this contingency should a case unfortunately occur. History records that the Duke of Richmond died near Ottawa of rabies contracted from the bite of a pet fox. I have unsuccessfully endeavoured to secure information regarding the fox in question. At that time rabies was not known to be present among other animals in the locality. We have, however, the report of a case of rabies in man at Victoria, B.C., contracted in the Yukon from the bite of a tame wolf. In the Southwestern States the disease has been reported to be conveyed by skunks to men sleeping in the open.

Such data must be considered in its bearing on the industry surrounding captive foxes, and given its proper weight when dealing with protective problems.

General Considerations in the Prevention of Infectious Diseases.—It has been my effort throughout in the preparation of this report, to point out some of the underlying principles which will prevent the introduction of infectious disease, rather than to enter the field of dealing with the treatment by drugs or otherwise, of every disorder to which the fox is heir. Such descriptions, to my mind, would only increase the uncertainty concerning the disorder or the method of treatment which should be adopted.

For these reasons I have considered it wise to give a great deal of attention to the location, construction, and protection of the ranch. The dead lines will effectively prevent the spread of infectious disease from pen to pen unless the infection is carried by the keeper. I have personally observed keepers passing from a pen in which worms had been found in the deposited excreta, directly to another pen without giving any attention to the cleansing of his boots, which would carry thousands of eggs. This seems to me to be an unwarranted chance where such valuable animals are concerned and, as had already been stated, such verminous infestation should be eliminated from the adult and the ranch. The value of the animals warrants this step being taken. A simple inexpensive precaution is that of having extra rubbers for the keeper, as these can easily be cleansed and disinfected.

On account of the dangers which may attend the promiscuous visiting of ranches by curious strangers, I believe that it would prove a wise precaution to permit them to view the foxes from a point of vantage that will eliminate the danger of introducing infection. If necessary, it would, in my opinion, be an economical procedure to build a suitable observation walk that could be sprinkled with a suitable disinfectant. Visitors introduce a hazardous factor which should be provided for to the fullest extent.

Malignant Growths, Tumours, Cancer.—Such growths have been found in a number of foxes examined at the laboratory under my charge. At the moment I cannot suggest the significance which should be placed on their occurrence, or the danger that may be anticipated. The subject of cancer has, within the past few years, received a great deal of attention from various investigators. The most recent work seems to indicate that diet may play an important part in its occurrence. In a number of experiments it has been shown that the experimental cancer has failed to grow when the series of animals was given a restricted diet, while another series allowed a liberal dietary was severely affected. It has not been possible to secure full details of the cases among foxes coming to our notice in routine laboratory work. I merely mention their existence to indicate a possible danger from this source which will naturally increase with the domestication of the fox.

XII.—TREATMENT OF DISEASES.

I have already pointed out that disorders should be dealt with by some person (preferably a veterinarian) skilled in the diagnosis of disease among animals, and in the use of drugs. With foxes, as with other animals and the human being, proprietary remedies should be regarded with suspicion as they are liable, in inexperienced hands, to do more harm than good. The manufacturers of specifics are anxious to sell their goods, and it is but natural that they should consider their particular formulæ specifics for the disorders described in their literature and booklets.

In my opinion drugs should only be used when the symptoms indicate the necessity, and then only under skilled direction. In diseased conditions we know of but few specifics, and these are of such a powerful nature that the greatest care must be exercised in their administration.

All disorders should be treated from the symptomatic standpoint after a correct diagnosis, and never given a drug on a chance shot, save in extreme cases.

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*(Supplement No. II to Report of Pathologist.)*IS *LEUCOCYTOZOOON ANATIS* THE CAUSE OF A NEW DISEASE IN DUCKS.

BY A. B. WICKWARE, ASSISTANT PATHOLOGIST, HEALTH OF ANIMALS—BIOLOGICAL LABORATORY, OTTAWA, CANADA.

(With Plates I—III.)

During the past summer numerous inquiries were received by Professor Elford, Dominion Poultry Husbandman, Experimental Farm, Ottawa, with regard to an apparently infectious disease appearing among ducks. So frequent and insistent were the appeals for aid in this connection that the co-operation of the Health of Animals Branch was requested. This resulted in an investigation being undertaken to ascertain the clinical nature of the disease; to demonstrate, if possible, the cause; and also institute measures for its prevention.

As a serious outbreak had occurred on a poultry farm in the vicinity of Ottawa, Ont., which threatened to jeopardize the existence of the plant, this place was chosen as a favourable location for commencing studies.

On arrival at the poultry farm in question, it was learned that the young ducks had been dying on an average of twenty a day. The losses would continue thus for a few days, after which there appeared to be a remission for about a ten-day period, with a recurrence at the expiration of this time when the fatalities would again be enormous.

Symptoms of the Disease.—The affection runs a rapid and fatal course with very slight prodromal symptoms to indicate its onset. The first clinical feature observed is an impaired appetite. This reluctance to take the ordinary amount of food is particularly noticeable in ducks having access to swimming pools. These birds prefer to remain in the cool water undisturbed, evincing no response to the call for feeding, and this fact is indeed significant.

The attitude of affected individuals varies considerably, depending upon the course of the disease. In some instances, ducks succumb during the first severe paroxysm, while in others exacerbations occur at intermittent periods without producing a fatal result. Affected ducks will lie in a semi-comatose condition with the neck bent backwards and the head resting upon the dorsal portion of the spinal column. When roused this condition of stupor gives way to a period of intense excitement, during which a series of remarkable evolutions are indulged in. The head occupies various positions, sometimes describing circles in the air, and at other periods, oscillating to and fro. In others the neck is completely turned upon itself with the head resting upon the ground in an upright position, as shown in plate I, figs. 1 and 2.

The power of equilibrium is also lost, the duck turning over backwards until completely exhausted. In the majority of recovered birds, there also appears to be some difficulty in locomotion, a decided lameness being present in one or other of the legs, usually the left one. Another manifestation which is fairly constant, is a purulent ophthalmia, the eyes being completely closed with the lids adherent to each other.

The mortality is exceptionally high, probably aggregating to 65 to 70 per cent, while the ducks which recover remain undersized and stunted, (plate I, fig. 3).

Etiology.—The causative agent is, as yet, undertermined, owing partly to the limited nature of our investigations. When first observed, the manifest cerebral disturbance was attributed by some poultrymen to the development of insect larvæ in

the nasal chambers through the deposition of eggs by a species of blue fly. In a few cases larvæ were found in the frontal sinuses, but only in those instances in which the affection was running a subacute course, the eggs probably being deposited after the duck was semi-comatose or moribund. In autopsies where the disease ran an acute course, larvæ were never found.

Microscopic examinations of the cerebro-spinal fluid, peritoneal exudates, etc., failed to reveal any organisms to which a pathogenic rôle could be ascribed, but as laboratory facilities were lacking at the time, cultural methods could not then be adopted, thus nullifying any general conclusion which might be drawn.

An examination of the blood revealed a *Leucocytozoon* which was present in large numbers in the peripheral circulation of the affected ducks.

Leucocytozoon anatis.—This parasite, to which so far as we are aware, no previous reference has been made, was observed during the course of the investigations. Subsequently, identical parasites were demonstrated in the blood of ducks similarly affected on the Experimental Farm, Ottawa. In view of the fact that no record of this parasite can be found, we are naming it *Leucocytozoon anatis*.

The parasites were present in large numbers in the peripheral circulation of ducks in which the affection ran an acute and fatal course. Smears from the spleen also showed an abundance of parasites. These protozoa gradually diminished in number in the ducks which made an apparent recovery, while in contact birds which presented no clinical manifestations, parasites were not demonstrable. Examination of the blood of other contact fowls as well as ducks from sources where the disease was not prevalent, failed to reveal any hematozoa.

Morphology.—The shape of the parasites is fairly uniform, although there appears to be considerable pleomorphism in the gamete forms. The predominant type is a spindle-shaped organism 35μ to 60μ in length by 10μ in width, showing an oval, elongated or irregularly shaped nucleus, with dark chromatic band extending along one border. The nucleus stains, with Giemsa, a dark blue having a granular appearance. In the centre may be observed a small chromatin staining body varying slightly in shape. The cytoplasm appears almost transparent or at most stains a faint pink and terminates at each end in an acute angle. Although, as previously mentioned, there is marked uniformity in shape, it might be advisable to state that considerable variation occurs in the staining characteristics of the mature forms. The chromatic band is similar in all instances, but in certain adult forms the nucleus stains indistinctly a light blue with radiating filaments of chromatin throughout.

Examined in fresh blood preparations, the parasite appears to be non-motile, but as it has recently been shown at Khartoum that motility is present in some of the larger forms, further studies must be undertaken before making a positive statement in this respect.

Pathological Anatomy.—Microscopically the visceral organs fail to show an abnormality excepting an acute hæmorrhagic inflammation of the large intestine immediately behind the cæca. The normal body fluids appear unaltered, while scrapings from the intestinal wall and examinations of the bowel content show an absence of coccidia or other parasites. In some of the ducks examined, the mouth and pharynx contained a considerable quantity of blood and mucus, the former probably being due to traumatic injuries sustained through the head coming in violent contact with the ground during the paroxysms.

The blood in all cases of infection showed an increase of eosinophiles, and the presence of *Leucocytozoon anatis*.

Transmission Experiments.—Our investigations along this line were necessarily limited, as experiments were conducted at the laboratory and all the affected ducks died excepting one survivor which was the only source from which material was available.

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Young ducks, three weeks old, were inoculated intraperitoneally with blood taken directly from the affected individual, and placed in a colony house free from infection. Control ducks from the same source were employed. A systematic examination of the peripheral circulation of these experimental ducks for some days previous to inoculation, together with the controls, was conducted. These resulted negatively in every instance, no variation from the normal being observed. Subsequent to inoculation, these examinations were continued daily and on the seventh day two gamete forms were noted in the blood of one of the artificially infected ducks. The controls appeared normal. These earliest forms appeared as organisms showing a transparent cytoplasm containing a few basophilic granules, with a band of chromatin at one side but possessing no nucleus. Three days afterwards, the typical gamete forms appeared showing the dark blue nucleus. These forms persisted for a few days and then suddenly disappeared. No mature forms were present in the smears examined at any time during the period of observation. White rats were also inoculated, but these proved refractory to infection.

Conclusions.—No general conclusions can be drawn until further experimental studies are undertaken, but a few salient features may be briefly summarized in closing. That the *Leucocytozoon* above described is the causative agent of this disease, we are not prepared to say. The fact, however, that this parasite was present in large numbers in all affected birds and absent in all the controls coming under our observation, is rather significant. Another peculiar feature is the disappearance of the mature forms from the blood stream of the affected duck in our possession, which seemed to coincide with the period of recovery.

The reason for our failure to transmit the disease may possibly be attributable to (1) The attenuated virulence of the parasite owing to the fact that the disease in this instance was running a chronic course and the duck was progressing towards recovery. (2) The fact that the disease appears to be prevalent only in the hot months of the year, as no fresh outbreaks have occurred at any of the plants under observation. (3) The fact that gamete forms appeared in one of the experimental ducks and then disappeared, might be taken to indicate that the disease, in an acute form, is not directly transmissible, the parasite undergoing an exogenous life-cycle dependent for its propagation upon some intermediate host, possibly an insect.

Providing opportunity presents itself, we intend undertaking a more methodical research into the etiology, prophylaxis and treatment of this affection.

I wish to express my indebtedness to Dr. F. Torrance, Veterinary Director General for permission to publish this preliminary report, also for facilities afforded me at the laboratory and the hearty co-operation of the officials of the Poultry Department.

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(Supplement No. III to Report of the Pathologist.)

AN ECONOMICAL MEASURING DEVICE.

(CHAS. H. HIGGINS, *Pathologist.*)

Through force of circumstances we are many times obliged to devise pieces of apparatus, for the performance of certain routine work in a laboratory, which are not provided for in the usual catalogues. Being confronted with the necessity of filling something over a hundred thousand ampoules per year, and having investigated the various types of ampoule fillers, including automatic burettes, vacuum devices, etc., I was not satisfied that any of these would meet the peculiar requirements of our work. Some of the more expensive of these were tried and found wanting, either in speed, defective mechanical construction, or accuracy. Furthermore, the majority were costly and required constant repairing.

We are all familiar with the old-fashioned burettes fitted with a two-way cock for filling and emptying, and to those who have worked with these I need not mention the strain caused in the muscles of the back and of the neck for they are so realistic as to need no description.

In the search for something better, many devices were experimented with, the principal factors being that to be satisfactory such an one must be comparatively cheap, easy of sterilization, accurate in measuring, permit no waste, and at the same time leave both hands free to enable the rapid sealing of the ampoules in the flame, and their labelling, at the one operation. No device available would meet these requirements. Needless to say the first experiments were not reassuring, for the requirements were very exacting as it was desired to attain the maximum speed, and, in so far as it was possible, to eliminate the personal factor in such work.

The results secured have been very gratifying and the photograph (plate I) shows a device made from material, the more expensive parts of which would have been thrown into the waste bucket as of no further use had they not been utilized for the purpose herein shown.

The requisites for this device are: an old ground glass barrel syringe (this may be one that has outlived its service for hypodermic work through being broken at the lower part to which the needle is applied), a three-way cock, some pure gum rubber tubing (preferably what is termed as heavy pressure tubing), a ring stand, clamps, etc., and a device with a thread which will permit of the gauging of the dose to be delivered. With these, a few weights, some twine, wire, or a fine chain, and a stick for a foot lever we have all that is required save a little ingenuity, which all laboratory workers should possess, to put the apparatus together.

The principle on which the apparatus works is that the three-way cock permits the liquid to run by gravity from an elevated source of supply into the adjusted hypodermic syringe, the syringe fills to the point determined, when a quarter turn of the cock allows the dose to discharge through the canula into the ampoule. The turning of the three-way cock for filling the ampoule is caused by pressure on the foot lever, and when this lever is released a counterpoise weight raises it, permitting the liquid to again fill the measuring device.

With this apparatus, both hands are free as has already been explained, the accuracy is assured, thus eliminating the personal element which is the most frequent source of error with all measuring devices. Its application is wide, as it may be used not only for the measuring of various biological products, but also for concentrated chemicals, such as carbolic acid when it is desired to make up a solution of a certain

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standard strength for any routine purpose, liquid culture media, or in fact any purpose which requires the repeated delivery of a given amount of any free-flowing liquid.

We have had two of these machines in constant use for the past three years, and while the experience gained has enabled their perfection and simplification, they stand essentially as when first set up. Circumstances have indicated the desirability of having such a machine constructed on a separate stand which may be moved from place to place as requirements may dictate, and one of these is now available (plate II) and is giving perfect satisfaction.

In the filling of ampoules it has been found possible for a novice to take up the work, and, if at all adept with the fingers, is able to fill, seal and label three hundred ampoules per hour. The great advantage is that once the ampoule is taken up in the fingers it is not laid down till all of the operations have been completed, and in this way a great saving in time is the result. The machine itself works rapidly, and it is never necessary (providing the proper adjustment has been made), to wait for the machine itself to complete its portion of the operation. The device being worked by a foot lever leaves both hands free for the various manipulations that are required.

For any purpose that necessitates the accurate delivery of a given amount of liquid I have yet failed to find any apparatus that will give equal satisfaction to the machine here described and shown in the photographs, providing there is a large amount of work to be accomplished. Where less than twenty-five individual measurements are to be made, this machine would not lend itself to practical requirements. But where there are from a few hundred to hundreds of thousands of packages to be put out, this device is in my opinion better than any which I have seen in use or figured in the various supply house catalogues. Further, it is cheap and may readily be constructed with material available even in the most remote localities.

APPENDIX No. 14.

(E. A. WATSON, *Pathologist in Charge.*)

VETERINARY RESEARCH LABORATORY, LETHBRIDGE, ALTA.,

March 31, 1915.

SIR,—I have the honour to submit herewith my report for the year ending March 31, 1915.

The main work of the laboratory has been in connection with dourine, in examining all the animals involved in different outbreaks, by serum methods of diagnosis, and in which the application of the complement fixation test has proved to be of the utmost value.

I firmly believe that this test can be trusted to indicate 100 per cent of the cases of dourine infection, provided, of course, that the conditions laid down are fully observed, and that by applying the test to the widest possible extent, wherever the disease may be thought to exist, dourine will cease to be a menace to horse-breeding. The problem, however, of dealing with the disease and making the best possible use of the test method of diagnosis is a serious one on the large ranches and Indian reservations, where thousands of horses are involved and where there is intermingling of different herds. The difficulties in the way of rounding up all the animals for a test, stopping the intermingling of stray herds or alien animals wandering on to a restricted area, and the enforcement of strict regulations during and between the test periods are great, but Dr. Hargrave, Chief Inspector for Alberta, is striving to overcome them and to see that the conditions necessary for a successful eradication test are complied with.

The following figures in connection with the complement fixation test for dourine show the extent of the application of the method of diagnosis and the amount of work performed at this laboratory in this respect for the year ending March 31, 1915:—

Suspected serum giving negative reactions.. . . .	6,194
“ “ “ positive reactions.. . . .	417
“ “ unsatisfactory reactions.. . . .	77
Bad specimens, unfit for test.. . . .	26
Total number of specimens received for test	6,714

For the previous year, ending March 31, 1914, 4,015 serum tests for dourine were made at this laboratory, 512 suspected sera giving positive dourine reactions.

In all this work we have employed a large number of control tests, using for this purpose our experimental dourine horses as well as several naturally infected horses that have been sent to this station. At the same time we have been continuously making experiments and observations in respect to the length of time after infection when the serum first gives a positive reaction, and following the reaction by repeated tests throughout the course of the disease and in those cases that have fully recovered from the disease. The results have been very interesting and very satisfactory in respect to the reliability and value of the test.

Our test records show that, diagnostic and experimental retests together, we have made over 15,000 tests during the past two years, not including the large numbers of preliminary tests and titrations and experimental tests of lesser importance that remain unrecorded.

For the collection of blood samples all the vials and apparatus required are prepared and sterilized in the laboratory and distributed at different points as needed.

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This in itself adds appreciably to the work of the laboratory staff. The office work has also much increased and takes up a great deal of my time that I would sooner spend in veterinary research.

In addition to our work on dourine we have made a fairly extensive investigation of swamp fever of horses, especially in regard to special properties of the blood and serum in this disease. A number of horses have been experimentally infected and died from the disease, experiments being carried on throughout the year. The work is still incomplete in several aspects, but I hope to have a report ready for publication in a few months.

We have also made complement fixation diagnoses in connection with glanders, and have made numerous examinations and test inoculations of suspected material and specimens from different diseases, among which may be mentioned anthrax, black-leg, malignant œdema, contagious abortion, carcinoma, etc.

In July last I was given the privilege of accompanying you to England to attend the International Veterinary Congress. Most unfortunately, the European war broke out just before the opening meeting, and the congress was abandoned before anything had been accomplished. I was able to visit some of the laboratories in England, however, before returning to Canada.

I have to express my highest appreciation and thanks for your interest and encouragement in our laboratory work. Also, to make sincere acknowledgment of the able assistance given by my co-workers.

Dr. W. L. Hawke was here for the first half of the year, and Dr. A. E. Cameron since May last. Both became expert in serological technique and methods of precision, and though the work has been extremely arduous, often taking us far into night or early morning hours, no complaint has been heard nor any strain put upon our friendly and helpful association.

Dr. H. Wehrbein was temporarily engaged in the laboratory, and did good work while here. Mr. Lewis, who looks after the stables, animals in pasture, does all the teaming required, and has multifarious duties to perform, is a steady and painstaking worker.

I have prepared for publication a full account of our complement fixation method of diagnosis in dourine, a copy of which I submit herewith as an appendix to this report.

I have the honour to be, sir,

Your obedient servant,

A. WATSON,
Pathologist.

To the Veterinary Director General,
Ottawa.

(Supplement to Report of E. A. Watson, Pathologist in charge, Veterinary Research Laboratory, Lethbridge, Alberta.)

DOURINE AND THE COMPLEMENT FIXATION TEST.

INTRODUCTION.

This paper is written with the purpose of drawing further attention to the value of the complement fixation reaction as a diagnostic test in dourine and of recommending a method of procedure and technique arrived at with an experience of 15,000 tests for dourine made at the Veterinary Research Laboratory, Lethbridge.

In a previous paper I have briefly described the serum reactions in dourine. Since that paper was published in 1912 (*Proceedings of the American Veterinary-Medical Association*) diagnostic tests for dourine have been carried along continuously at this laboratory, together with exhaustive control and experimental tests and the searching out of every possible source of error. By the numbers of horses available for experiment, the prolonged trial of the test through every known phase of the disease and its widest application in naturally occurring outbreaks, coupled with observations in company with the veterinary officers in charge of the field work, the complement fixation reaction has been thoroughly established as a sure, safe and specific method of diagnosing dourine. The experience shows that the test meets every requirement with regard to specificity, uniformity and decisiveness. It has been adopted as the official test for dourine in this country by Dr. F. Torrance, Veterinary Director General for Canada, who kindly permits me to publish this paper.

By the complement fixation test it has been possible—and without difficulty—not only to make a certain diagnosis of the more or less symptomatic cases, but, and of greater importance, to positively determine the existence of the non-clinical, obscure and latent forms of infection.

Only by a systematic application of the test to every animal exposed to infection—and in no other way known at present—can the healthy-looking, so-called immune carriers of dourine be detected. When it is remembered that horses may tolerate a dourine infection for periods of one to three years and remain for that time normal in general health and appearance but capable at times of transmitting the disease, the necessity of an early and definite diagnosis is evident. The complement fixation test furnishes this and thus becomes of great importance as a basis for the control and suppression of dourine. It is being applied in every known outbreak of dourine in Canada, and, as a precautionary measure, in the various studs and to stallions standing for service in the districts that have come to be considered as dourine-infected areas.

BRIEF EXPLANATION.

The general principles and mechanism of the complement fixation reaction are now so widely known that it seems unnecessary for the purposes of this paper to repeat them in detail, a few remarks on the subject sufficing to make it clear and intelligible.

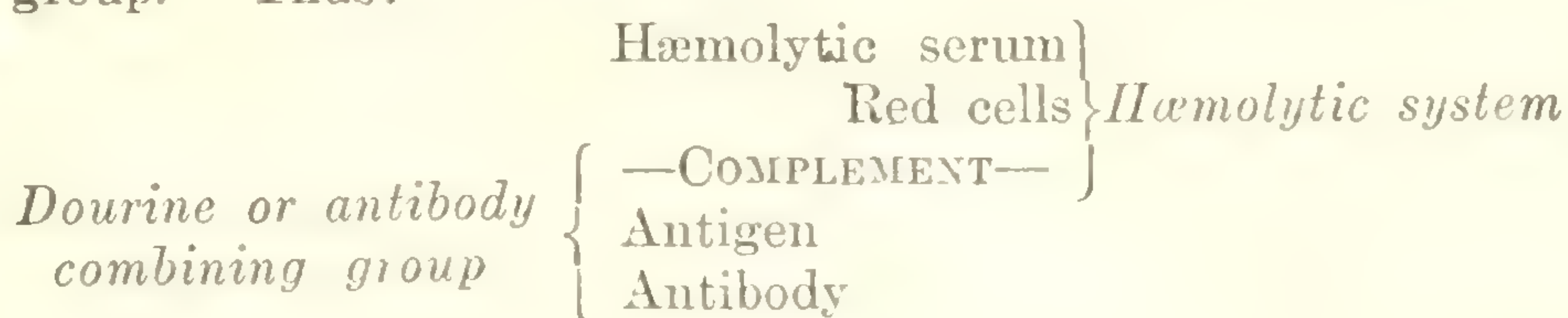
When an antigen is introduced into an animal either by way of natural infection or by artificial administration a group of reaction products arise in the animal's serum—known as antibodies—bearing a specific relationship to the antigen and able to combine with it outside of the animal body under certain conditions. Micro-organisms, foreign blood cells and sera, albumens and many forms of protein matter are able to act as antigens. Thus an animal infected with dourine produces antibodies resulting from and specifically related to the dourine antigen, namely *Trypanosoma equiperdum*, the actual cause of the disease.

In a similar manner, an animal which has received injections of the blood of another animal species becomes possessed of antibodies having a specific affinity for the blood of that particular species of animal. In other words, the antibody arising in response to the exciting antigen in the process of infection, sensitization, or immunization, has the specific function of acting upon that antigen to neutralize it or prepare it for destruction.

The complement fixation test applied in the diagnosis of disease consists of two sets of an antigen and antibody, that is, two distinct and separable combining groups having no relationship to one another, but in each of which *Complement*—a constituent of normal serum—is an essential factor. It is convenient to distinguish these groups by referring to the one comprising hæmolytic serum, red cells and complement

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as the "hæmolytic system" and to the other—closely related to the disease—comprising dourine antibody, corresponding antigen, and complement as the "antibody-combining group." Thus:



Before the test can actually be applied the exact dosage of the different elements in each group must be worked out by careful quantitative titrations—the most important step in the whole proceeding—and the operator must be absolutely assured that each group reaction is under his perfect control and that the least disturbing factor will be known to him. In the actual test only one complement unit is employed (the minimal amount necessary for the completion of the hæmolytic system) so that only one of the reaction groups can come into operation; it is according to whether the complement unit is attracted and affixed to the antibody-combining group or to the hæmolytic group that we obtain a positive or a negative reaction. The former will always be affected when the antigen and antibody correspond, that is, when the serum tested contains the specific reaction products of dourine infection even though in minutest quantity, so delicate is the reaction. Neither the antigen alone nor the serum alone, when properly prepared, can take up the complement unit; to do so, all three factors must be brought into intimate contact, and when the test serum does not contain specific dourine antibodies the complement is not fixed to this group but remains free to join with and complete the two factors of the hæmolytic system, so that the red cells undergo hæmolysis and a negative reaction is indicated.

TECHNIQUE AND PROCEDURE RECOMMENDED.

Apparatus required.—Heavy glass tubes without lip, 5 inches by $\frac{5}{8}$ inch, and racks to hold twenty-four tubes in a double row, one above the other. Small test tubes, 4 inches by $\frac{3}{8}$ inch, for serum inactivation. Finely graduating measuring pipettes of 0.1, 1.0, 5.0 and 10.0 c.c. capacities. Graduated cylinders of 50 and 100 c.c. capacities. Erlenmeyer flasks of heavy glass, standard sizes up to 500 c.c. capacity. Large centrifuge cups and small centrifuge tubes. Ampoules and vials. A high power centrifuge machine, large water bath, and incubator room.

All glassware is sterilized by dry heat.

Diluting, Washing and Preserving Fluids.

- (1) Normal salt solution—0.85 per cent pure sodium chloride in freshly distilled water. A large quantity should be made up (5000 c.c.) and sterilized in flasks having a siphon attachment.
- (2) Citrated salt solution—

Normal salt solution..	100.0
Sodium citrate..	1.5
- (3) Preserving fluid for trypanosomes—

Normal salt solution..	96.9
Pure neutral glycerine..	10.0
Formalin (Scherings)..	0.1
- (4) Preserving fluid for serum—

Glycerine..	95.0
Phenol..	5.0

I.—PREPARATION OF REAGENTS.

A. *The Hæmolytic System.*

(a) *Red Cells*.—A quiet sheep may be bled in the standing position, otherwise it should be placed upon its back in a V-shaped trough and held there by the attendant, an assistant shaving the neck and preparing the site of operation. The operator draws from the jugular vein, under aseptic conditions, 50 c.c. (more or less) of blood into a flask containing glass beads and in which the blood is defibrinated. It is then run through a double layer of fine, sterilized gauze into large centrifuge cups, about 20 c.c. of blood in each, adding three to four times the amount of salt solution. The corpuscles are thrown down by centrifugal force, the upper fluid taken away and replaced with fresh salt solution, and the mixture again centrifuged. Washing in this way is repeated three times, when the red cells are carefully measured and suspended in an equal amount of salt solution, this 50 per cent stock suspension being stored in the ice chamber until needed.

(b) *Hæmolytic Serum*.—Rabbits have a variable amount of natural hæmolytic amboceptor for sheep's corpuscles—0.1 c.c. of fresh rabbit serum will usually hæmolyze a like amount of 5 per cent corpuscle suspension. For test purposes a serum with a much higher hæmolytic index is required and to obtain this rabbits are hypersensitized or immunized by repeated injection of sheep's corpuscles until a serum is given showing a hæmolytic index of 0.0005.

Not less than six large healthy rabbits should be selected for the immunization, for one or several are apt to die from shock during the process. The rabbits are injected intraperitoneally with a first dose of 2.5 c.c. of the 50 per cent stock suspension of sheep's corpuscles. Every four to five days a further injection is given, each time increasing the dose until, after five or six injections, it has reached 10 c.c. This dose is repeated once or twice. After the sixth or seventh injection 5.0 c.c. of blood is drawn from the heart of each rabbit, using a hypodermic syringe and a fine needle. The operation can easily be performed and does no harm to the animal.

The serum of each rabbit is then heated for one half-hour at 56° C. and the hæmolytic index established by titration (*vide* p. 106). It will be found, probably, that in only two or three rabbits out of six can the hæmolytic index be raised to the desired degree, namely, 0.0005 or better. From such rabbits as much blood is drawn from the heart as will not endanger the life of the animal—about 25 c.c. The rabbits are then kept in reserve and can easily be reimmunized as required.

Finally, the serum is separated from the corpuscles and stored in very small ampoules—0.2 c.c. in each ampoule for convenience and economy—in the ice chamber.

When the serum is not to be used immediately it requires neither inactivation nor carbolization, and is, in fact, better without, the index remaining constant or but very slightly lowered even after six months. But unless the serum has been collected under aseptic conditions, rather than risk it spoiling, 1.0 c.c. of the carbolized glycerine preservative is added to 9.0 c.c. of serum before measuring it into the ampoules.

The whole procedure of immunizing rabbits, drawing blood from the heart, separating and bottling serum, can and should be carried out under aseptic conditions.

(c) *Complement*.—Normal guinea-pig serum in a fresh state furnishes a rich complement. Blood may be drawn from the heart, if desired, but as guinea-pigs are usually plentiful at a laboratory it is simpler to anaesthetize the animal in an ether jar, remove and suspend the guinea-pig over a centrifuge tube of 25 or 30 c.c. capacity, sever the arteries and veins on one side of the neck, and collect all the blood.

Centrifuge immediately, before coagulation takes place. The clear serum is taken off and placed in the ice chamber. Complement is always better used in the fresh state so the guinea-pig should not be bled until just before complement is needed for a titration or a diagnostic test.

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B. *Dourine (antibody) combining group.*

(x) *Antigen*.—A stock dourine antigen is obtained as the result of inoculating a number of white rats with *Trypanosoma equiperdum*, collecting the rat's blood when teeming with trypanosomes, and separating the trypanosomes from blood cells and serum by washing and centrifuging.

The blood of a dourine infected rat is collected in a vessel containing sufficient salt solution to prevent coagulation. Not less than ten large white rats—twenty or twenty-five rats, if a considerable amount of antigen is needed—are inoculated intraperitoneally with the diluted blood, injecting an equal amount, about 0.3 c.c., into each rat. This may be done very conveniently by taking a small sharp-pointed pipette, with rubber tubing and mouthpiece attached, drawing the blood up to a point marked by a file or pencil, and expelling it into the abdomen, repeating the process with the same pipette for each rat. The object is to have all the rats come down together with a heavy infection. In the ordinary course a white rat dies of dourine between the end of the third and the beginning of the fifth day of infection. When twenty-five rats are inoculated at the same time about fifteen of them show a heavy trypanosome infection at the end of the third day, the remainder within the next twelve to twenty-four hours. It is necessary to make a rapid cover-glass examination of the blood of each rat forty-eight hours or so after inoculation and to sort the animals according as they show a light or a heavy infection into two or more groups. The result of the first blood examination will indicate approximately the time for a second examination and upon that the hour for bleeding may be judged. The timing of this operation is important for in the last six or eight hours of infection the trypanosomes multiply enormously, and if the rats are left until well on into this stage a very rich antigen will be furnished. Careful timing, however, is necessary, for it may easily happen that eight or ten rats will all die within one to two hours, if left too long. The bleeding should be carried out as rapidly as possible. The writer's method is simple and effective and may be worth describing in detail:—

A running noose is made out of a 2-foot length of thin copper wire, doubled over in the middle and twisted to the ends, the ends being passed through the ring formed at the beginning of the twist to form the noose and attached to any convenient fixture over a laboratory wash basin, 6 inches above an operating board resting across the basin. An ether jar, a flask of citrated salt solution, two sterile covered beakers and a razor complete the outfit.

An assistant passes the rats one at a time into the ether jar and hands them over as required. The animal is held back downwards in the left hand of the operator whose index or middle finger presses on the left front limb of the rat. The noose is slipped over the head and arranged so that the pull stretches the left side of the neck bending the head slightly to the opposite side, backwards and downwards. A beaker half filled with citrated salt solution is placed in position under the neck, the arteries and veins on that side and close to the shoulder then severed with a single sweep of the razor. Usually, the animals bleed better if one avoids severing the trachea. In this way ten rats may be bled in half an hour. The volume of blood and citrated salt solution should be about equal or a slight excess of the latter. The mixture is then passed through a double layer of sterile gauze to remove any small clots and fibrin into narrow centrifuge tubes, 10 mm. diameter and 10 c.c. capacity (when wider tubes are used it is more difficult to separate the trypanosomes and the wastage is greater). Centrifuge not longer than four to five minutes at 1,500 revolutions per minute so that the bulk of the corpuscles are thrown down while the trypanosomes remain in suspension. Draw off the cloudy suspension fluid into fresh tubes, then the upper layer of corpuscles—more or less mixed with trypanosomes—into another tube, and the next layer into a second tube, adding citrated salt solution and again centrifuging for eight to ten minutes. Draw off and discard as much of the upper fluid as appears clear and free from trypanosomes. Then collect from each tube into a single tube

the upper pure white layer of trypanosomes, in another tube the middle layers slightly soiled with blood, and in a third and fourth tube the lower layers in contact with the blood cells. Add normal salt solution now, not citrate, shake up well and centrifuge again, repeating the washings until all the trypanosomes are obtained in a pure white mass.

Ten rats bled at the right time will furnish 5.0 c.c. of trypanosomes. Twice the volume of the glycerine-formalin preservative is added and the mixture stored in sealed amber ampoules, 1.0 c.c. in each, in a block of ice; 5.0 c.c. of trypanosomes will make 100 c.c. of antigen, sufficient for more than 500 diagnostic tests. The antigen will keep indefinitely if solidified by freezing, and for 6 to 8 weeks or longer when stored in liquid form, in sealed ampoules, on ice.

(y) *Antibody*.—In the diagnostic tests the antibody, of course, is or is not present in the suspected test serum. But for purposes of control and titration and to thoroughly understand the combining action of dourine antigen and antibody it is absolutely necessary to have one or more series of known positive or specific dourine horse sera, of which the antibody content can be determined. To obtain this a horse is inoculated with *Trypanosoma equiperdum*. Ten days later and at weekly intervals thereafter, blood is drawn aseptically from the jugular vein, the serum collected and tested for antibody content (*vide* p. 112). A series of specific positive sera are thus obtained, representative of different periods and stages of the disease. Stored in the ice chamber the sera will retain their specific properties for many months, even years, if collected sterile. If not absolutely sterile the serum may be preserved by adding 1.0 c.c. of 5 per cent carbolized glycerine, or the same amount of iodized glycerine to 9.0 c.c. serum. At the same time one should collect and store a number of negative control sera under the same conditions.

H. TITRATION OF REAGENTS.

(1) *Titration of Haemolytic Serum (Amboceptor).*

Prepare the following stock dilutions of serum and corpuscle suspension:—

		c.c.	
1.	Haemolytic serum (rabbit anti-sheep)	0.1	
	Normal salt solution (0.85 per cent.)	9.9	
		10.0	....1:100
2.	Complement—		
	Fresh guinea-pig's serum	1.0	
	Normal salt solution	19.0	
		20.0	....1:20
3.	Corpuscle suspension—		
	Washed sheep's corpuscles (50 per cent stock suspension)	2.0	
	Salt solution	23.0	
		25.0	....1:25

Further dilutions of the hæmolytic serum are made as under:—

Tube No.	Salt solution.		Haemolytic serum.		
	c.c.		c.c.		
1	3.0		1.0 (1:100)	equals 1:400	(0.0025 serum in 1.0 c.c.)
"	2	5.0	1.0	"	" 1:600 (0.0016 " ")
"	3	7.0	1.0	"	" 1:800 (0.0012 " ")
"	4	9.0	1.0	"	" 1:1000 (0.001 " ")
"	5	0.5	1.0 (1:1000)	"	" 1:1500 (0.00066 " ")
"	6			shrdl	aocmfwy aordlu aofwyp aovbgkqj aom
"	7			shrdl	aocmfwy aordlu aofwyp aovbgkqj aom
"	8			shrdl	aocmfwy aordlu aofwyp aovbgkqj aom
"	9			shrdl	aocmfwy aordlu aofwyp aovbgkqj aom

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In each tube 1.0 c.c. only of the dilution is held back, the excess amount being discarded, 1.0 c.c. each of complement and red cell suspension added, which with 2.0 c.c. salt solution make a total volume of 5.0 c.c. in each tube.

The complete titration set is then:—

	Serum Dilutions (as above).	Salt solution.	Complement 1:20.	Red Cell Suspension.	
	c.c.	c.c.	c.c.	c.c.	
Tubes 1-9.....	1.0	2.0	1.0	1.0	Titration set.
Tube No. 10....	1.0	3.0	—	1.0	Serum control (1:100 dil.)
“ 11....	—	3.0	1.0	1.0	Complement control.
“ 12....	—	4.0	—	1.0	Red cell control.

Mix well and incubate for two hours at 37° C.

The control set, tubes 10, 11 and 12, must not show any trace of hæmolysis.

The *titre* of the hæmolytic serum is indicated by the amount present in the *last* tube of the series 1 to 9 in which dissolution of all the red cells is *complete*, that is, the least amount necessary to dissolve a definite amount of red cells.

For example, if in tubes Nos. 1 to 6 hæmolysis is complete, not quite complete in tube No. 7, and still less in Nos. 8 and 9, then the titre is the amount of serum in tube No. 6, or 1.0 c.c. of a 1:2000 dilution, 1 unit being expressed as 0.0005.

A serum with a unit value of between 0.0002 and 0.0005 is quite satisfactory, but when the value of a single unit exceeds the latter amount the results are not so good.

The relationship and combined action of hæmolytic amboceptor and complement should be clearly understood. To do this a number of experimental tests should be undertaken, using in one series only one unit of amboceptor with fractional amounts of complement, in another series two units of amboceptor and lesser complement fractions, four units and so forth, progressively multiplying the number of amboceptor units while further reducing the fractions of complement. It will be found, for instance, that two units of amboceptor require a lesser amount of complement than one unit to completely hæmolyse a standard amount of red cells. The lesser the amount of complement that can be safely employed in the practical tests the more delicate becomes the fixation reaction, the equilibrium of the hæmolytic system being more easily upset, even by a test serum naturally weak in antibody content and which, if a relatively large complement unit was employed, might be insufficient to give a complete reaction. On the other hand the reduction of complement must not be carried to such an extreme point that any slightly inhibitive property of one of the other reagents would tend to obscure it and give a false fixation.

It is essential that for all subsequent titrations and tests a standard dose of hæmolytic amboceptor be fixed and rigidly adhered to. For all practical purposes the use of two units of amboceptor permit of a sufficiently fine gradation of complement, while still allowing a margin of safety. The dose is therefore fixed constantly at two units, to which complement is always titrated as in the next procedure.

(2) Titration of Complement.

Prepare (1) a stock dilution of guinea-pig complement, and (2) a suspension of sheep's corpuscles, as in the previous titration.

Also (3) an hæmolytic serum (amboceptor) dilution, so that 1.0 c.c. of the diluted serum contains two amboceptor units. For example, if the value of one unit is 0.0005, then 0.001 will be that of two units, the dilution being accordingly 1:1000.

The titration of complement is of the utmost importance and requires the greatest accuracy, as already indicated. Until one has become familiar with the technique and expert in reading the reactions the titration is best carried out in a double set, the second set having one-half of the amount of each reagent used in the first set, the one serving as a check to the other.

The two sets are arranged as follows:—

Titration of Complement.

First set.				Second set.					
		Salt Solution c.c.	Complement c.c.	Hæmol. serum c.c.			Salt Solution c.c.	Complement c.c.	Hæmol. serum c.c.
Tube No.	1	2·0	0·3 (1 : 20)	1 0		1·0	0·15 (1 : 20)	0·5	
"	2	2·0	0·4	1 0		1 0	0·2	0·5	
"	3	2·0	0·45	1·0		1·0	0·225	0·5	
"	4	2·0	0·5	1·0		1 0	0·25	0·5	
"	5	2·0	0·55	1·0		1·0	0·275	0·5	
"	6	2·0	0·6	1 0		1·0	0·3	0·5	
"	7	2·0	0·65	1·0		1·0	0·325	0·5	
"	8	2·0	0·7	1·0		1·0	0·35	0·5	
"	9	2·0	0·8	1·0		1·0	0·4	0·5	
"	10	2·0	1·0	0·5		1 0	0·5	0·25	
"	11	3·0	.....	1·0	.....	.....	.....	.....
"	12	3·0	1·0	.....	2·0	.....	.....	.....
Add 1 c.c. red cell sus- pension to each tube.				Add 0·5 c.c. red cell sus- pension to each tube.					

Mix well (avoiding undue frothing).
Incubate at 38 to 39° C.
Agitate the mixtures again by shaking the racks after ten minutes incubation.
Read the reactions one hour later.

Tube No. 10 controls the original hæmolytic titration, only one unit of amboceptor being used with an excess of complement. In this tube complete hæmolysis should occur.

Tube No. 1 will show only slight or partial hæmolysis; as one descends the series the reaction is seen to be increased, until, usually between Nos. 4 and 7, a tube is reached in which the reaction is absolutely complete. The first tube in the series in which all the red cells are completely dissolved indicates the complement titre. If this occurs in tube No. 5, for example, then 0.55 c.c. of a 1:20 dilution of complement is the titre, equivalent to 1.0 c.c. of a 2.75 per cent dilution.

For the antigen titration and final tests the complement is accordingly made up so that 1.0 c.c. of the dilution contains the amount of complement indicated by the above titration.

From now on it is optional whether one employs the relatively large amounts of reagents as given in the first set of complement titration, or the one-half amounts as in the second set. The latter is the more economical, especially when a large number of tests are being performed, and is given personal preference to by the writer as it seems to provide an even more highly sensitive test reaction than when the larger amounts are employed.

(3) Titration of Antigen.

Dilute 1.0 c.c. of stock trypanosome antigen with 19.0 c.c. of normal salt solution.

Prepare the complement and hæmolytic serum according to their titration values already determined.

Inactivate by heating for half-an-hour at 58° C. in a water bath, 2.0 c.c. of known positive dourine horse serum and 2.0 c.c. of known negative or normal horse serum.

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The antigen is then titrated in a double set, the one being with the positive serum, the other with double the amount of negative serum. Thus:—

Controls.	POSITIVE SET.				NEGATIVE SET.			
	Salt sol. c.c.	Known positive horse serum c.c.	Antigen c.c.	Comple- ment c.c.	Salt sol. c.c.	Known negative horse serum c.c.	Antigen c.c.	Comple- ment c.c.
Tube No. 1.	1.0	0.1	0.02	0.5	1.0	0.2	0.05	0.5
" 2.	1.0	0.1	0.05	0.5	1.0	0.2	0.1	0.5
" 3.	1.0	0.1	0.1	0.5	1.0	0.2	0.2	0.5
" 4.	1.0	0.1	0.15	0.5	1.0	0.2	0.3	0.5
" 5.	1.0	0.1	0.2	0.5	1.0	0.2	0.4	0.5
" 6.	1.0	0.1	0.25	0.5	1.0	0.2	0.5	0.5
" 7.	1.0	0.1	0.1	0.5	1.0	0.2	0.6	0.5
" 8.	1.0	0.2	.....	0.5	1.0	0.2	.....	0.5
" 9.	1.0	.....	0.25	0.5	1.0	.....	0.5	0.5
" 10.	1.5	.....	.....	0.5	2.0	.....	.....	.....

Mix well and incubate for one hour and ten minutes at 38 to 39° C.

Mix together equal quantities of hæmolytic serum (amboceptor) and red cell suspension, then add 1.0 c.c. of the mixture to each tube.

Shake again and incubate for two hours longer.

It is usually possible to read the antigen titre in 1½ hours and proceed with the final tests; nevertheless, the tubes should be left or replaced in the incubator for the full two hours and then put on one side for further reference and to see if any further action has taken place.

Tube No. 10 is the control for the hæmolytic system and must show complete hæmolysis. No. 10 in the second set contains only hæmolytic amboceptor and red cells and must not show the slightest degree of hæmolysis. Nos. 8 control the horse serum, Nos. 9 the antigen, the red cells being hæmolysed in all.

The positive set will show more or less complete fixation of complement—no hæmolysis, except perhaps in the first and second tubes, the negative set complete hæmolysis. When the antigen appears very strong there may be some inhibition in the negative set in the tubes containing the larger amounts of antigen.

The amount of antigen to be selected as the titre for the final tests is that which gives complete fixation with the positive serum while double the quantity in the corresponding tube of the negative set does not prevent or inhibit hæmolysis.

III.—THE SERUM TO BE TESTED.

Collection of Serum.—The chief point aimed at in collecting blood from suspected animals is sterility, especially when the specimens have to be transported over long distances and mailed to the laboratory. Absolute sterility is not essential, nevertheless as near as possible aseptic conditions are to be strongly recommended and the avoidance of adding carbolic acid or any other antiseptic fluid to the sample specimen as a preservative. The blood clot should be well formed and the serum odourless and clear or only slightly tinged with hæmoglobin.

The condition of a sample of blood may vary greatly according to the size and shape of the vial or tube containing it, the slowness or rapidity with which blood is run into the vial, the partial or complete filling of the vial, the shaking of the specimen before coagulation has occurred, and in other ways irrespective of aseptic conditions and of abnormal properties of the blood itself. In square or rectangular

bottles and in specimen vials without a neck the clot has a tendency to cling firmly to the sides, the serum being separated with more or less difficulty. In small round bottles, curved into a narrow neck and mouth, for corks, filled with freely flowing blood to within a margin of the narrowest diameter but not touching the cork, and allowed to stand for at least half-an-hour for coagulation, there is usually an abundance of clear serum.

Such bottles, of one ounce capacity, one inch in diameter, three-eighths inch neck and mouth, are very suitable for field work. They must be absolutely clean and free from any trace of soap, alkali or acid. These bottles are distributed from this laboratory after being sterilized in the hot air oven, corked, labelled and well wrapped in sterile paper wrappers. Also, large bore needles attached to three inches of rubber tubing with a small glass nozzle, separately wrapped and sterilized. With this simple apparatus and observing the usual precautions during operation it is an easy matter to draw blood from the jugular vein of a horse, aseptically.

Among the last 6,000 samples of blood secured in this manner less than twenty have reached the laboratory in a condition unfit for testing and these few unfit specimens have been ten days or more in transit.

On reaching the laboratory the specimens are briefly examined and where necessary the clots are detached from the sides of the bottles with a sterile wire. They are then left to stand in a cool chamber overnight for the serum to clear. The serum is then drawn off into small test tubes, about 2.0 c.c. in each, and is ready for inactivation.

Inactivation of Serum.—Before any specimen of horse serum can be used in the complement fixation test it has first to be inactivated. All animal serum in a very fresh state contains complement in a varying amount. This constituent is readily destroyed by heating the serum to 55 to 56° C. for one half hour. No complement other than that employed in the haemolytic system may take part in the reaction. As a matter of fact horse complement very rapidly becomes inert and in specimens several days old is a practically negligible quantity. However,, in normal horse serum there arise several other factors which, unless destroyed or rendered inactive, are able to act upon complement and antigen and disturb an haemolytic system. All untreated horse, donkey and mule sera possess enzymotic and proteolytic properties, potentially at least, and becoming active in sera a day or two old. They act upon most preparations of antigen, especially upon macerated organs, such as the liver and spleen, and are all more or less anti-complementary, more so in the presence of antigen than without it. Such action, of course, is non-specific and must be eliminated, otherwise it would be difficult or impossible to distinguish a specific from a non-specific reaction. Fortunately it can be eliminated, and the equilibrium of the serum fixed, by a proper and sufficient inactivation. *It is more resistant to heat than is complement and is not wholly destroyed at 56° C.* This is an important point, and one that appears to have been overlooked. I cannot help thinking that it is the explanation and the source of error of many of the apparent failures or discrepancies, especially that of non-specific fixation, which some serologists experience. A reference to the literature on complement fixation methods shows a remarkable lack of uniformity in respect to the degree of heat and the length of time for the inactivation of suspected sera—fifteen to thirty minutes at degrees varying between 50 and 58° C.

A few experiments with sets of ten or twenty different horse, mule and donkey sera, each set being heated for thirty minutes at different degrees between 50 and 62 C. and then tested in the haemolytic system, with and without antigen, will show the importance and necessity of a very careful inactivation and the temperature required (*vide p. 111*).

Method of inactivation recommended.—A water bath, sufficiently large to hold 200 small test tubes, is heated to 60° C. The tubes, containing 2.0 c.c. serum in each (numbered for identification in waterproof india ink, labels being apt to become detached), are placed within the inner tank which is to contain sufficient water to mount to the level of the serum or to about half the height of the tubes. The cover of

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the tank should have two perforations for thermometer tubes which are inserted into control tubes within the tank, enabling the temperature to be read without removing the cover: Another thermometer passes directly into the outer tank. For the first few minutes the temperature will rapidly fall; it is brought up to 59° again—taking about ten minutes—and maintained at that point for a full half hour, for horse serum, and to 62° for one-half hour for donkey or mule serum.

There is no danger of destroying the specific antibodies of dourine sera by heating to the points given. Dourine sera can, in fact, be heated up to 65°, or to the point of coagulation, and still retain an active antibody content to give the test reaction, but the anti-complementary and non-specific factors in horse sera are wholly destroyed at 59°, and in donkey and mule sera at 62°.

To control the inactivation, with each batch of suspected sera several known positive dourine sera as well as known (anti-complementary and non-specific) negative sera are included and all tested together in the final diagnostic test.

Experiment showing the degree of inactivation of suspected serum necessary for specific reactions.

Dose of serum, 0.2 c.c., unheated and heated at different degrees of temperature and tested with trypanosome antigen as in the diagnostic test.

Normal healthy horses.		Unheated serum.	Serum heated for one-half hour at degrees Centigrade.						
			50	54	56	58	60	62	64-65
No.	1	++++	++++	++	+	-	-	-	-
"	2	++++	++++	++	+	-	-	-	-
"	3	++++	++++	++	+	-	-	-	-
"	4	++++	++++	+++	++	-	-	-	-
"	5	++++	+++	+	-	-	-	-	-
"	6	++++	++++	++	(?)	-	-	-	-
"	7	++++	++++	+++	++	-	-	-	-
"	8	++++	+++	+	(?)	-	-	-	-
"	9	++++	++++	++	(?)	-	-	-	-
"	10	++++	+++	++	+	-	-	-	-

			Inhibition. Non-specific.			
Dourine horses.						
No.	1 (1st year of disease)		++++	++++	++++	++++
"	2 (" ")		++++	++++	++++	++++
"	3 (" ")		++++	++++	++++	++++
"	4 (" ")		++++	++++	++++	++++
"	5 (" ")		++++	++++	++++	++++
"	6 (" ")		++++	++++	++++	++++
"	7 (2nd " ")		++++	++++	++++	++++
"	8 (3rd " ")		++++	++++	++++	++++
"	9 (4th " ")		++++	++++	++++	++++
"	10 (5th " ")		++++	++++	++++	++++

			Specific complement-fixation.						
Normal mule	1	++++	++++	++++	+++	+	-	-	-
"	2	++++	++++	++++	++++	++	+	-	-
Normal donkey	1	++++	++++	++++	+++	++	+	-	-
"	2	++++	++++	++++	++	-	-	-	-

Inhibition. Non-specific.

++++ See page 112 for the meaning of these reaction expressions.

Note.—In the non-specific inhibition reactions the red cells are loosely sedimented. In the specific complement fixation reactions the red cells are precipitated in a mass or agglutinated in clumps. When the sera are tested without antigen, as in the serum controls, the dourine sera, of course, give no specific reactions, but the inhibition reactions are given by normal and dourine sera alike when insufficiently inactivated, though to a lesser degree than when antigen is present.

Conclusion.—Suspected horse serum must be heated to at least 58° C. (59 to 60° for safety) and mule or donkey serum to 62° C., to eliminate non-specific reactions.

The Antibody content of Dourine Sera, and the dose of suspected Serum necessary for a Diagnostic Test.

The maximum dose of horse serum used in a diagnostic fixation test is 0.2 c.c. This amount is not exceeded for fear of any disturbance to the haemolytic system by the non-specific reactions which larger doses are apt to cause. Double the amount can actually be used with perfect safety provided the serum is correctly inactivated. But it is unnecessary to use more than 0.2 c.c., for that amount of serum of a dourine horse will contain in the case of a serum very weak in antibody content at least one unit, and in the case of a serum strong in antibody ten, twenty, forty or more units—and one unit of antibody is sufficient to give a positive reaction with the fixation test.

That this is so may be determined by taking a series of sera collected from animals in active and in latent phases of the disease and titrating out each serum for antibody content.

The experiment is carried out as follows:—

The sera are first inactivated by heating for one half hour at 59° C. Three stock tubes are then taken for each serum, (1) containing the pure serum, (2) a dilution of 1 : 10, and (3) a dilution of 1 : 100, these dilutions permitting of the accurate measurement of the smaller doses.

Twelve tubes are now arranged for each serum to be tested—the first and last to contain 0.2 c.c. of undiluted serum, the largest amount used in the test, the last tube being the serum control without antigen, the intervening tubes to contain gradually decreasing doses of serum. Enough salt solution is then added to make up to 1.0 c.c. in each tube, then the antigen and complement in amounts previously determined by careful titration, and finally, after incubation for seventy minutes, haemolytic serum and red cells—as in a diagnostic test.

An experiment of this kind is given below, the titres of seven sera from different horses in different phases of the disease being determined.

Experiment for determining the Antibody content of Dourine Sera by the Complement Fixation Method.

Dose of inactivated dourine serum. cc.	Complement fixation reaction with dourine serum.						
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
0.2 (undiluted,	++++	++++	++++	++++	++++	++++	++++
0.15 standard	++++	++++	++++	++++	++++	++++	+++
0.1 doses)	++++	++++	++++	++++	++++	++++	++
0.075 (0.75 of 1 : 10)	++++	++++	++++	++++	++++	++++	+
0.05 (0.5 " ")	++++	++++	++++	++++	++++	++++	—
0.025 (0.25 " ")	++++	++++	++++	++++	+++	++++	—
0.01 (0.1 " ")	++++	++++	++++	++++	++	—	—
0.0075 (0.75 " 1 : 100)	++++	++++	++++	—	+	—	—
0.005 (0.5 " ")	++++	++++	++++	—	—	—	—
0.0025 (0.25 " ")	++	++	—	—	—	—	—
0.001 (0.1 " ")	+	—	—	—	—	—	—
0.2 (serum control without antigen)	—	—	—	—	—	—	—
Indicated value of one antibody unit	0.005	0.005	0.0075	0.01	0.05	0.025	0.2
Number of antibody units in 0.2 c.c. of dourine serum — maximum dose.	40	40	26½	20	4	8	1

+ + + + means complete fixation of complement—absolutely no trace of haemolysis. Red cells more or less clumped. A very strong positive reaction.

+ + + is also a strong positive reaction, with just a faint trace or tinge of haemolysis.

+ + is a rather weak positive indicating partial fixation—about one-half the red sells haemolysed.

+ a very weak or faint positive—slight fixation, with more than one-half the red cells haemolysed.

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—, a negative reaction. Complete haemolysis of red cells.

The smallest dose of serum which combines with antigen to cause complete fixation (++++) indicates the value of one antibody unit, and from this may be calculated the number of units in the standard or maximum dose and the value of a dourine serum in antibody content.

Such values are more relative than absolute, for the titre of a dourine serum may be somewhat higher or lower according to the amount of dourine antigen present and the fineness with which the haemolytic system has been adjusted—just as the titre of the haemolytic serum itself is correlative to the amount of complement and red cells (antigen).

The seven sera, Nos. 1 to 7, used in this experiment are taken from dourine control horses in the first, second, third, fourth, fifth, sixth and seventh year of the disease, respectively. No. 1, from a mare showing clinical symptoms; No. 2 from a stallion showing occasional symptoms; Nos. 3 and 4 from mares very rarely showing symptoms and progressing towards recovery; Nos. 5, 6, and 7 from mares that have not shown any symptoms for three, four and five years respectively, and which have made complete recovery, been bred to a healthy stallion each year—without transmitting infection—and raising healthy offspring.

In addition to the above, among our experimental horses that have recovered from dourine, there are two mares that give a positive (++++) reaction with 0.2 c.c. serum after six years, and one mare a positive (+++) after seven years. On the other hand, there are three mares that have entirely ceased to react, even with twice or three times the amount of serum, after six to seven years of recovery, although they reacted positively up to the fifth year.

Conclusion.—0.2 c.c. of horse serum from a dourine infected animal contains up to forty units of specific antibody. In the case of horses that have completely recovered from dourine and which are no longer able to transmit the disease, one or several units of antibody are present in the same amount of serum up to the fifth year of recovery. After that period they may cease to react—indicating that not only was an absolute recovery made but that the immunity was lost in about five years (proof of which has been given by inoculation experiments with *T. equiperdum* on recovered horses).

For diagnostic tests it is sufficient to use three doses of serum, namely, 0.2, 0.15 and 0.1 c.c.

The first appearance of a positive serum reaction in dourine infections.

Having fixed upon a standard dosage of suspected serum, it is now necessary to know the incubation period of dourine and when a first positive serum reaction may be expected, for otherwise a negative reaction would be valueless or even misleading.

In this connection there follow the records of some experiments:—

Experiment for determining the length of time between dourine infection and the first appearance of a positive serum reaction.

A healthy filly, 2½ years old, was infected with dourine by smearing over the vaginal mucosa a few drops of blood containing *Trypanosoma equiperdum*.

Serum was collected from this young mare before infection and daily up to the fifteenth day after infection, and tested by the complement fixation method, with trypanosome antigen. The results were as follows:—

Dose of serum c.c.	Before infection.	Days after infection.					
		1 to 10	11	12	13	14	15
0.2	—	—	+++	++++	++++	++++	++++
0.15	—	—	++	++++	++++	++++	++++
0.1	—	—	+	+++	++++	++++	++++
0.05	—	—	—	—	++	++++	++++
0.01	—	—	—	—	—	—	++
0.005	—	—	—	—	—	—	+

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Thus, the first appearance of a positive serum reaction was eleven days after infection.

In three earlier experiments of this kind, but in which serum was not collected for testing until the twentieth day after infection, the reaction in each case was strongly positive.

The incubation period of dourine in the light of the complement fixation test is indicated, by the above experiments, as not less than eleven days and not over twenty days. However, the strain of dourine used in these experiments was of high virulence; when horses become infected with strains of low virulence—and there is much variation in dourine strains—the incubation period is probably prolonged.

A negative reaction should not be taken as final or conclusive when the interval between exposure to infection and the collection of test serum is less than two months.

IV. THE DIAGNOSTIC TEST.

Two methods of procedure are here recommended:—

- (1) When only one or several tests are to be made.
- (2) For daily routine testing or when 50, 100, or more tests are to be made at one time.

In either case a necessary preliminary is the titration of complement (*vide*, p. 108). This established, sufficient complement dilution is made up—0.5 c.c. of the dilution to contain the smallest amount indicated by titration—to do for the titration of antigen and for as many serum tests and controls as are to be made. It is advisable to make up an excess of complement rather than have a deficit, so as to use one stock uniform dilution throughout and avoid having to make up fresh stocks during the testing.

The trypanosome antigen is then titrated against a known positive dourine serum and a known negative serum (*vide*, p. 109).

First method of procedure—for one or several tests.

Four tubes and one pipette of 1.0 c.c. capacity, graduated 1 to 100, are needed for each serum to be tested. 1.0 c.c. salt solution is measured into each tube. In each set of four tubes 0.2, 0.15, 0.1 and 0.2 c.c. of the inactivated test serum is added. Antigen in the amount already decided by titration is now added to the first three tubes in each set, omitting it from the fourth tube which serves as a serum control. Complement, 0.5 c.c. of the dilution required, is then added to all tubes. Sets of positive and negative sera are included with the above, and, in addition, controls for the various reagents. For the reagent controls five tubes are needed: (1) Antigen control, omitting the test serum, (2) haemolytic control, omitting serum and antigen, (3) haemolytic serum control, omitting test serum, antigen and complement, (4) complement control, omitting test serum, haemolytic serum and antigen, (5) red cells control containing only red cells and salt solution. The controls are made up to a uniform volume of 2.5 c.c. by adding salt solution as required.

When the test serum, antigen and complement have been mixed together, the tubes are incubated at 38 to 39° C. for 70 minutes.

Equal quantities of the haemolytic serum dilution and the red cell suspension (4 per cent) are mixed together and 1.0 c.c. of the mixture added to every tube excepting the last two controls, Nos. 4 and 5, to which 0.5 c.c. red cells only are added.

The tubes are again shaken and incubated for another two hours when the reactions may be read, a second reading being made the following morning, about twelve hours later, the racks being left at a cool-room temperature meanwhile.

The above procedure is indicated in the following table:—

TABLE showing method of procedure for a diagnostic fixation test.

	Tube No.	Salt solution c.c.	Test serum c.c.	Antigen c.c.	Complement c.c.	Mixture of haemolytic serum and red cells		Fixation	Reaction		
						c.c.	c.c.		Strong positive. (haemolysis)	Weak positive. (haemolysis)	
<i>Diagnostic set for each suspected serum.</i>											
	1.	1.0	0.2	0.2	0.5	1.0	1.0	++++	++	Weak positive. (haemolysis)	
	2.	1.0	0.15	0.2	0.5	1.0	1.0	++++	++		
	3.	1.0	0.1	0.2	0.5	1.0	1.0	++++	++		
	4.	1.0	0.2	—	0.5	1.0	1.0	++++	++		
<i>Serum control.</i>											
	1.	1.0	0.2	0.2	0.5	1.0	1.0	++++	Complete fixation.	Complete haemolysis.	
	2.	1.0	0.1	0.2	0.5	1.0	1.0	++++	"		
	3.	1.0	0.2	—	0.5	1.0	1.0	++++	Complete haemolysis.		
<i>Test control with known negative serum.</i>											
	1.	1.0	0.2	0.2	0.5	1.0	1.0	—	Complete haemolysis.	"	
	2.	1.0	0.2	—	0.5	1.0	1.0	—	"		
<i>Reagent controls :</i>											
(a) Antigen	1.	1.0	—	0.2	0.5	1.0	1.0	—	Complete haemolysis.	"	
(b) Haemolytic system	2.	1.0	—	—	0.5	1.0	1.0	—	"		
(c) Haemolytic serum	3.	1.5	—	—	—	1.0	1.0	—	No haemolysis.		
<i>(d) Complement</i>											
(e) Red cells	4.	1.5	—	—	0.5	0.5	0.5	—	"	"	
	5.	2.0	—	—	—	0.5	0.5	—	"		
70 minutes at 38-39° C.											
2 hours at 38-39° C. First reading of reactions.											
12 hours at cool-room temperature. Second reading of reactions.											

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Second method of procedure—for daily routine testing or when 50, 100, or more tests are to be made.

This is only a slight modification of the first method of procedure to allow of more rapid and less laborious work in testing large numbers of suspected sera.

Two test series are made, the first series, in which only one tube for each serum is used (instead of four tubes as before), containing the maximum dose, 0.2 c.c., and antigen, eliminating all negative sera and at the same time indicating the positive sera. These latter are again tested on the following day, using the four tubes—the three standard doses of serum and serum control—as in procedure No. 1, including them with the next lot of sera to undergo the first test in which the single tube is used.

If a negative serum does not give a fixation reaction with 0.2 c.c. serum it certainly will not with the lesser doses, and as a serum control is only needed in the case of a serum which fixes complement, the single tube is obviously all that is required to determine a negative serum. Further, the sera with which complement fixation takes place in the one series serve as additional controls when included with and fully tested out in the second series—one day's work thus checking the other, continuously.

In routine testing at this laboratory, when large numbers of sera are being dealt with, it is the practice to make a repeat test with each serum negative at the first test and to arrange the work and the different series so that each day's tests include: (a) a series not before tested (one tube for each serum); (b) the sera tested the day before with negative result (one tube for each serum); (c) the sera tested the day before with fixation reactions (four tubes for each serum); and, in addition, the usual series of known positive dourine sera, negative controls and reagent controls.

All suspected sera are thus tested twice over so that if any error or omission in the technique has been made it will surely be indicated.

Interpretation of the reaction.—Fixation of the complement, not in itself visible in the test tube, is indicated by the prevention of haemolysis of the red cells and constitutes a positive reaction, on which a diagnosis of dourine is given.

When no complement is fixed the red cells are completely haemolysed and the reaction is then said to be negative.

The prevention or inhibition of haemolysis may be complete, partial or slight—according to the richness of the serum in specific antibodies. However, with the standard doses of serum, in the great majority of cases, the reaction is either clearly positive or clearly negative. Occasionally, complement fixation complete with 0.2 c.c. serum, partial with 0.15 c.c. and slight with 0.1 c.c. may be given. This is a positive reaction and indicates that the serum is weak in antibodies, only one unit being present in 0.2 c.c. serum.

Partial fixation with 0.2 serum and complete haemolysis with 0.1 serum is a rare reaction and of a questionable nature. In the serum controls, without antigen, haemolysis should always be complete. Very rarely indeed it happens that haemolysis in the serum controls is not complete, the mixture having a cloudy or opaque appearance and some of the red cells remaining unhaemolysed. This may be the result of insufficient inactivation or of changes in the serum due to certain bacterial growths. When such questionable reactions are given a fresh specimen of serum is asked for and a retest made.

GENERAL REMARKS.

The successful practice of the complement fixation test depends mainly upon the preparation and use of powerful reagents, their specificity and the accurate determination of their relative values, the fixing of standard doses wherever possible, and a constant, uniform technique and method of procedure.

Close familiarity with the activity of the reagents is essential for the best results.

Stock reagents should be prepared in quantities calculated to meet all requirements for as long a time as the activity of the reagents remains practically constant. Thus:

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sufficient hæmolytic serum for six months' work; antigen to suffice for one month's work; fresh red cell suspension once a week; fresh complement daily or on alternate days, or as needed. It is advisable to use the blood of two sheep for sensitizing rabbits and to use the red cells of the same sheep for the hæmolytic system.

The following points of extreme importance will bear repetition:—

(1) The amount of red cells in suspension must be very accurately measured and the standard amount never varied.

(2) The use of the least possible amount of complement which with two units of hæmolytic serum causes complete hæmolysis of red cells.

(3) The use of twice the amount of antigen which with a dourine antibody unit is necessary to fix the complement, provided the same amount of antigen alone has no inhibitory action.

(4) Careful control of the inactivation of suspected sera by known positive and known negative sera.

(5) Control of the diagnostic tests by a series of known positive sera, each having an antibody unit of different value, high to low.

DISCUSSION.

The reliability of the complement fixation test as a certain and specific means of diagnosis has been questioned, not, I think, very seriously or on strictly scientific grounds, but more in respect to its practical application and on an unwarranted supposition that it is still very imperfectly understood, that the technique and method of procedure is so intricate and laborious, that the reactions themselves are subject to and have to be guarded against so many possible disturbing influences that the adoption of such method of diagnosis is attended with considerable risk.

Can the test be practically applied?—Yes, without doubt, and with as much ease as a mallein or tuberculin test it applied. In the one case blood is collected in the field and sent in for a laboratory test, in the other the reagents are prepared in the laboratory and sent out for a field test. Further, as many retests can be made by the complement fixation method as desired, for no toxins or immunizing substances are injected into the suspected animal to interfere with subsequent diagnostic tests. This test is no longer a new departure in veterinary diagnoses; it is successfully applied in glanders, contagious abortion and in other specific diseases and is yearly coming into more general use.

Are the test reactions and the different factors concerned in them imperfectly understood?—Such a view is not held by serologists and can only be retained by those who have not the opportunity of closely studying the subject and becoming familiar with the finer points of it. Any attempt to apply the test by one who has not thoroughly mastered the technique and gained complete control of the reagents would, of course, be dangerous. But the complement fixation reaction furnishes the most perfect, biological, diagnostic test yet devised, one in which all adverse or disturbing factors can be eliminated and in which a clear knowledge of the properties and mode of action of the reagents has been ascertained,—far more so, in fact, than that of a mallein or tuberculin reaction which, in application and interpretation, is crude in comparison. The very delicacy of the fixation reaction and the strict laws and conditions governing it, add to the exactness, value and reliability of the test.

Is the technique too intricate and laborious?—Not more so than many other necessary and accepted laboratory methods, and this is essentially a laboratory test.

Is it necessary to use a pure suspension of trypanosomes as antigen?—By the employment of a pure suspension of dourine trypanosomes as antigen non-specific and false or misleading reactions are avoided. Many other ways of preparing antigen

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for the dourine test have been tried by different investigators but, with one exception, with little success. Mohler and Eichhorn recommend a spleen preparation of a rat dead from surra. I have used the spleens of rats dead from dourine in several thousand tests and with very good results, but, on the whole, such preparations are inferior to the trypanosome suspension and possess a number of disadvantages. Spleen preparations are often troublesome on account of a more or less anticomplementary action or owing to a weakness in specific antigenic property. They are very unstable and of inconstant value and give rise to many borderline or questionable reactions which can be eliminated or definitely decided by the trypanosome antigen. In comparative titrations of dourine sera with the two forms of antigen I have found that approximately one-tenth of the amount of serum necessary for a positive reaction with spleen antigen suffices for a clear positive reaction with trypanosome antigen. Very weak positive reactions with the former become clearly and strongly positive with the latter, which, therefore, should always be given the preference. The trypanosome suspension has also the great advantage of retaining a constant value for several weeks at least, for six to eight weeks if carefully prepared, and thus allows of the keeping of a uniform stock antigen.

What is the percentage of positive reactors in dourine outbreaks?—This of course varies according to the length of time the disease has been in existence in a stud or range herd before being checked by preventive measures. In the most extensive outbreak that we have had to deal with 456 positive reactors were found in a total of 2,000 animals tested; nearly 23 per cent. In an outbreak on an Indian Reservation, 127 animals gave positive reactions out of 1,464 tested, or less than 9 per cent. Usually it is between 15 and 20 per cent. Our experience indicates that 100 per cent of dourine infected animals, whether in active or latent stages of disease, give positive serum reactions, provided that an interval of two to three months has been allowed for an incubation period in the more or less resistant animals, less than one month being sufficient in most cases.

How does the value of the dourine test compare with the Wassermann test for syphilis?—The old name of horse syphilis still clings to dourine infections, especially among stock owners and the general public, and comparisons have been made both in regard to the nature of the disease and the diagnostic tests, tending to lead to mistaken conclusions.

The reaction in dourine by the method recommended in this paper is a specific one. A positive reaction in other diseases or with animals in which dourine infection could be excluded, remains unknown to us, while in every authentic case of dourine the reaction is invariably positive. In my whole experience there is only one case in dispute—a negative serum reaction being given where a symptomatic diagnosis of dourine was made. However, the symptomatic diagnosis may have been at fault; unfortunately, the animal was destroyed before any proof or disproof of dourine infection was forthcoming.

The very few cases on record where a negative dourine reaction at a first test was followed by a positive reaction at a second or later test can be accounted for by infection taking place only a few days before the serum was first collected, or by continued exposure to infection between the first and later test.

In syphilis, on the other hand, negative reactions are of more value for prognosis than for diagnosis. A positive reaction may become negative after a short course of treatment returning again to positive if a cure has not been effected. Further, it is admitted that a negative reaction is frequently given in primary syphilis and again at times in latent and tertiary syphilis. A source of error, operating in the negative direction, is, as Noguchi has pointed out, in that human serum contains a variable amount of natural anti-sheep amboceptor, which in some cases may be sufficient to

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hide a positive reaction. Horse serum does not contain anti-sheep amboceptor, as I have found by many experiments, so that the anti-sheep haemolytic system can be used in horse serum tests with perfect reliance.

A positive Wassermann reaction may be given in several diseases in which syphilitic infection can be excluded, in leprosy, scarlatina, certain forms of tuberculosis and carcinoma. The Wassermann reaction is not specific. Owing to the great difficulty of obtaining a pure syphilitic antigen, the extract of a syphilitic liver was first used in Wassermann's original method. But, later on, it was found that non-specific extract of normal liver and other organs answered equally well, and such are now commonly used. The reaction in syphilis is not accordingly a true and specific antigen-antibody combination and is dependent upon more or less gross changes in the serum of syphilitic patients. It is not to be compared, therefore, and is greatly inferior to our test method for dourine either in delicacy, specificity or trustworthiness.

In conclusion, I venture to express absolute confidence in the complement fixation test for dourine as it is now presented, and to claim that apparent failures or discrepancies are due, not to the method itself, but to faulty technique on the part of the operators or of the collectors of the test serum.

APPENDIX No. 15.

(*Seymour Hadwen, D. V. Sci., pathologist in charge, Agassiz, B.C.*)

AGASSIZ, B.C.

SIR,—I have the honour to submit my annual report for the year ending March 31, 1915.

The investigations which were undertaken during the year were varied. The addition to the laboratory has been of great assistance.

In October, Mr. G. H. Unwin handed in his resignation, to take up military duties in Vancouver. Since that time I have been without assistance in the laboratory, and many of the duties which were undertaken by Mr. Unwin have fallen on my shoulders. It is to be hoped that before long it will be possible to secure the services of another assistant, as it will be impossible for me to do all the routine work, as well as the investigations which are so urgently needed in this province.

My annual report this year is brief, owing to the unfinished state of many of the experiments.

BOVINE HAEMATURIA

The experiments have been continued throughout the year, and a distinct advance has been made. However, as some are not yet complete, it is thought advisable to withhold them until a complete summary of the work can be given.

The interest shown by the farmers in this disease is again becoming manifest. For the past three years comparatively few letters on the subject have been received; now, owing no doubt to the financial depression, numerous inquiries are coming in. Previously, farmers sold their diseased animals for what they could get, or killed them, often at a sacrifice; now they are anxious to make the utmost out of their animals, and their interest in the diseases has revived correspondingly.

The work described last year is being carried through, and experiments with oxalic acid have been successful. There is no doubt in my mind that the theory I advanced in my previous report is correct; but since the multiplication of results is necessary before proof is conclusive, I am deferring publication till all the experiments now under way are completed.

AN OBSCURE DISEASE AMONG CATTLE IN THE KAMLOOPS DISTRICT.

Several journeys have been made to this district to study what is thought to be a new local affection among the cattle and sheep. The reports which I have sent to you deal with this question in fuller detail than can be given here. Authority has been given to continue experiments on a larger scale, both at the Experimental Farm here, and in the affected district.

“BIG KNEE,” A DISEASE IN CATTLE.

Early in the year a journey was undertaken to Alexandria, on the Cariboo road. A small percentage of cattle have been found affected each year with swellings in the joints. On the date of my visit, eight diseased animals were found.

The external swellings were visible principally on the knees, but after killing two of the animals it was found that the other joints were affected, though the swellings were not so prominent. The disease causes the animals great pain; it is not of a suppurative nature, nor were any bacteria found in the lesions.

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The animals become emaciated, and as a rule the disease progresses slowly but surely until they die. One or two recoveries have been noticed, but the animals were left in a crippled condition. It is intended to make a further study of this disease when opportunity offers. The theory which you have advanced, that it is of a rheumatoid nature, will be carefully worked out.

AN INVESTIGATION INTO THE SYMPTOMS OF PIGS FED ON RICE MEAL.

At the request of Mr. J. H. Grisdale and Mr. P. H. Moore, Superintendent of the Experimental Farm, Agassiz, I have been co-operating with them in their experiments. This course was sanctioned by you.

The first report of this work was published in the annual report of Experimental Farms for 1913-14, and this year a second report will appear in the same publication.

Owing to the great interest which is being taken in nutrition diseases, especially in beri-beri, to which this affection is so closely allied, the work seems worthy of continuation.

TICK PARALYSIS.

There is very little to add to the previous work on this disease, though one or two reports of the occurrence of tick paralysis were received at the laboratory.

A few additional notes have been made on the habits of Dermacentors, and some new hosts have been added to the list, which is given below.

Since the publication of my first paper in 1913, in *Parasitology* (Camb.), and that of Hadwen and Nuttall in the same issue, other articles have appeared dealing with the same question. A review on Tick paralysis in man and animals was published by Nuttall in *Parasitology*, vol. 7, No. 1, 1914. He proved that tick paralysis was a definite disease and could be transmitted by ticks of different species; but that the only real experimental evidence produced had reference to *Dermacentor venustus* alone.

A paper by Mally, 1904, and Borthwick, attributes a disease called "tick paralysis" in sheep in Cape Colony, to the animals being attacked by *Ixodes pilosus*, Koch.

Todd, in the *Journal of Parasitology*, Urbana, vol. 1, No. 2, reviews some more cases in the human subject, and at the end of his paper describes some unsuccessful experiments on animals.

Additions to the list previously published, Appendix No. 9, pp. 93-99, Health of Animals Report, 1913:—

*Genus Ixodes.**Ixodes ricinus* L. det. S.H.

1 ♀ off dog,

Victoria, B.C. 8/30/12 (Coll. E. M. Anderson).

Several ♀'s off *Odocoileus columbianum*,

Duncan, B.C. 18/12/12 (Coll. S. H.)

1 ♀ off man,

Goldstream, B.C. 1/2/12 (Coll. E. M. Anderson).

♂'s and ♀'s off dog,

Maple Bay, B.C. 15/11/12 (Coll. S. H.)

10 ♀'s and ♂'s off dog,

Maple Bay, B.C. 19/3/14 (Coll. D. Ashby).

Ixodes texanus—

1 ♀ off *Scjurus h. douglassi*,

Agassiz, B.C. 6/7/12.

Ixodes hexagonus var. *cookei* (Packard, 1869) det. Nuttall,

1 ♀ off dog,

Mount Lehman, B.C., 1914 (Coll. S. H.).

Ixodes pratti Banks, det. S. H.

1 ♀ off horse,

Milk River, Alta. Summer, 1913 (Coll. S. H.).

Ixodes auritulus, Neumann, 1914, det. Nuttall.

1 ♀ off *Haliæetus leucocephalus alascanus* Townsend,

1 ♂, 10 L., off *Cyanocitta stelleri carlottæ*,

Masset, Queen Charlotte Islands, B.C. 23/6/10 (Coll. E. M. A.).

One more species of *Ixodes* has been taken of which the identity has not yet been established.

Genus Hæmaphysalis.

Hæmaphysalis punctata C. and F. now becomes, according to Nuttall *Hæmaphysalis cinnabarina* Koch, 1844, as this last name has priority over *H. chordeilis* Packard. Types are 2 ♀ in the Berlin Museum.

H. cinnabarina occurs in both North and South America, while in Europe *H. punctata*, C. and F., now becomes *H. cinnabarina* var. *punctata*.

Hæmaphysalis leporis palustris Packard,

off rabbits, Prince Albert, Sask., 8/6/14 (Coll. Dr. F. Torrance).

87 ♂'s, 21 ♀'s and L., off rabbit,

Agassiz, B.C. 18/5/12 (Coll. S.H.).

NOTE.—This last record indicates that the sexes copulate upon the host. These ticks were kept together in a large glass container for several days, and watched carefully to see if copulation ever took place off the host. This was not seen to take place, and no ticks were found in copula.

Genus Dermacentor.

Dermacentor venustus.. 13 ♂'s and ♀'s captured on *Nectoma cinera* (Bush-rat), at Okanagan Falls, B.C., 1913; collector, E. M. Anderson.

On a bear at Creston, B.C.; collector, J. D. Frank.

NOTE.—The finding of adults on *N. cinera* is of importance, owing to the idea, prevalent in the United States, that only immature stages are to be found on rodents.

FOLLICULAR MANGE.

Last year a short report was made on a specimen sent in by Dr. White. A fresh case of this interesting disease has been discovered on the Experimental Farm. Treatment is being undertaken, but is not sufficiently advanced to warrant the publication of results. I attach a photograph of the animal, showing the extensive lesions, which have invaded the whole of the fore-trunk (plate 1, figs. 1 and 2).

WARBLE-FLY INVESTIGATION.

During the past winter and early spring a careful watch has been kept on the gullets of cattle, to try to discover the migration of the larvæ from that region to the back. Dr. E. A. Bruce and his staff at the abattoir of P. Burns & Co., have collaborated with me in this study. With Dr. Bruce I have prepared a paper, which is now ready for publication.

SESSIONAL PAPER No. 15b

During the past summer, observations were made on the egg-laying habits of both *Hypoderma bovis* and *Hypoderma lineatum*. The publication of this work was sanctioned by you, and appeared in volume 7, No. 4, of *Parasitology* (Camb.). I would refer interested persons to this publication.

Other observations were made on *Cuterebra fontinella* Clark (Cotton-tailed Bot). I would recommend the reprinting of this article as an appendix to my report, since it has a bearing on the problem of the penetration of the larvæ of warble-flies in general.

BLOOD-SUCKING DIPTERA.

For some years notes have been made on the habits of blood-sucking diptera in British Columbia, especially of the *Tabanidæ* (Horse flies). A paper was prepared giving a list of the varieties encountered in this province, and some notes on their habits. This list was published in the proceedings of the Entomological Society of British Columbia.

Another short paper was read, on the occurrence of *Anopheles maculipennis*, one of the known transmitters of malaria.

PATHOLOGICAL SPECIMENS.

The number of specimens sent in yearly is increasing. A considerable number have been received from the meat inspection staff of P. Burns & Co. The diseases encountered were as follows, in order of importance: rabies, tuberculosis, blackleg, and several varieties of cancer and cysts from cattle and swine. Specimens of poultry diseases have also been received, and a number of parasites, ectozoa and entozoa.

An interesting specimen came from Dr. Richards of Charlottetown, P.E.I., who sent me a warble larva which he had extracted from a horse. This is of comparatively rare occurrence.

Another specimen worthy of mention, from Dr. Bruce, showed a case of chronic hyperplasia of the spleen. A photograph made by Dr. Jarvis is attached to this report (plate 2, fig. 1). Some specimens have also been received from medical men.

I have the honour to be, sir,

Your obedient servant,

SEYMOUR HADWEN,

Pathologist in charge Research Laboratory.

APPENDIX No. 16.

SUMMARY REPORT ON SAMPLES SUBMITTED BY THE MEAT INSPECTION DIVISION.

BY FRANK T. SHUTT, M.A., D.Sc., *Dominion Chemist.*

This work, which has been carried on in the laboratories of the Experimental Farm system since 1908, consists in the chemical and microscopical examination of samples collected by the inspectors of the Meat Inspection Division in the course of their inspection duties at the various packing houses and fruit and vegetable canneries throughout the Dominion. The object of this investigational and control work is to determine the nature and purity of the several products examined, in order that the latter as put out may conform to the regulations and meet the requirements or standards established by law for the protection of the consuming public.

The nature, character and scope of the work, as at present carried on, have been outlined in the following paragraphs.

Food preservatives.—From ancient times, various processes have been employed for the preservation of foods. These include chiefly, drying, smoking, salting, preserving with sugar, and pickling with vinegar. In more recent times the sterilization by heat and the subjection to low temperatures (cold storage) to arrest or prevent changes in perishable food products, have been largely used. All of these, if satisfactorily conducted, may be regarded as unobjectionable.

The modern practice of employing chemicals, such as boric, salicylic, benzoic, and sulphurous acids and their salts, for the preservation of foods, has added greatly to the work of the chemist. It is highly important to know if these compounds have been used to arrest fermentation and, if so, to what extent. The use of certain of these preservative chemicals is entirely forbidden in foods, while in the case of others the amount that can be employed is strictly regulated.

In the work of the year, the analysis of a large number of preservatives and preservative mixtures, as used in the several packing and canning establishments, has been undertaken. It has also included, in this connection, the critical examination for preservatives of a very considerable number of samples of prepared meats and meat products, sausage, etc.

Numerous samples of benzoate of soda, sulphite of soda, borax, nitrate of soda, etc., etc., have been examined as to purity and adherence to the regulations.

Colouring Matters.—The presence of artificial colouring matter in food products is a matter that in these days must engage the careful attention of the food chemist. The object in the use of such colouring matter may be to mask an objectionable condition of the product or to meet an alleged public demand for a more or less highly coloured product. The presence of permitted colouring matter may be allowed in certain products while entirely forbidden in others.

The artificial colourings now used in food products are almost entirely coal tar colours. The regulations permit only seven of these, and these must be free from arsenic and heavy metals. Reference to the subjoined table shows that numerous dyestuffs have been examined as to nature and purity. Many samples of food products, meats, spices, condiments, etc., have also been submitted to analysis with the object of determining the presence of added colouring matter.

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Excess Water, and Cereal in Meat Products.—In addition to the examination for preservatives and artificial colouring matter, meats and meat products, sausage, mince meats, etc., have been subjected to analysis with the view of ascertaining if they contain excessive amounts of water and cereal.

Spices and Condiments.—Spices and condiments have been more particularly examined for the presence of foreign material, as starch, colouring, and preservatives.

Desiccated Fruits and Vegetables.—During the year a large number of samples of evaporated apples have been analysed as to water-content. An excessive amount of water in desiccated fruits and vegetables, constitutes not only a worthless make-weight, but is a menace to the keeping qualities of the product, as it favours the growth of moulds and bacteria.

The Bleaching of Fruits and Vegetables.—Since the subjection of fruits and vegetables before desiccation to the fumes of burning sulphur is a common practice for the purpose of bleaching, preventing discolouration, and to prevent the attacks of insects, fungi, and bacteria, the examination of many such samples of dried products has been necessary to ascertain if the sulphurous acid remaining in them exceeds the amount permitted by the regulations.

Lards and Lard Compounds.—Lard, lard compounds, and their constituents have been analysed as to composition and purity. This examination has entailed a considerable amount of research work of a chemical and physical nature.

Samples examined.—A classified statement of the samples examined during the fiscal year ending March 31, 1915, is as follows:—

SAMPLES Received from the Meat Inspection Division, 1914-15.

Nature of Sample.	Number Received.
Lards, tallows, oils, butters.....	13
Preserved meats, sausage, mince meats, etc.....	123
Colouring and dyestuffs.....	147
Preservatives.....	145
Pickling solutions.....	50
Spices and condiments.....	120
Evaporated apples and waste.....	26
Miscellaneous.....	29
Total.....	662

The increase in the work during recent years is shown in the following figures:—

1911 (samples examined)...	86
1912 ".....	86
1913 ".....	185
1914 ".....	510
1915 ".....	662

Brief mention may be made of certain special investigations recently undertaken.

Ink.—In the branding of meats at the inspected establishments, a considerable amount of ink is used. The requirements for such an ink are that it should be easy of application and not "run," that it should dry quickly and that it should not easily blur, erase, or bleach. After considerable experimental work in the Farm Laboratories, an ink satisfactory as regards the foregoing requirements was prepared. This

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ink is now being made at the laboratories for use by the inspectors and incidentally, it may be remarked, that its cost is much lower than that of the purchased ink previously employed.

Disinfectants.—Special attention has been given to the examination of commercial disinfecting compounds, marketed chiefly under the name of crude carbolic acid. This has been made necessary by the extensive use of these materials for the disinfection of stock yards, cars, etc., following the outbreak of the foot-and-mouth disease in the United States. The results constitute a valuable addition to our knowledge of these compounds.

Acknowledgement.—In concluding this outline of the work accomplished, I wish to bear testimony to the skill and the careful, valuable work of Mr. C. H. Robinson, B.A., Assistant Chemist, who for some years past has been specially in charge of the analytical and microscopical investigations necessary to a satisfactory examination of the samples submitted.

APPENDIX No. 17.

(*L. L. Cooke, Chief Inspector, Live Stock Cars and Yards.*)

OTTAWA, March 31, 1915.

SIR,—I beg to submit herewith my report for the year ending March 31, 1915.

My duties during the major portion of the period were confined to the various live stock markets, as well as to the railway and other stock yards used for the public accommodation of animals, either in transit or when offered for sale.

The progress in this work has been greatly improved in the past year, and at the present time it is difficult to find a railway or other stock yard which is not in a clean, comfortable, and sanitary condition. The same is true of stables owned by the railway and stock-yard companies at the principal shipping points, and at every large public stable in which horses or other live stock are held for sale or shipment.

A marked improvement has been made with regard to all stock cars used for conveying live stock. They are cleansed and disinfected by the various railway companies, under the supervision of car inspectors, at all the principal divisional points, and it is somewhat difficult to find a dirty stock car on any of the railway lines to-day.

I have personally supervised the cleansing and disinfecting of a large number of stock cars at Ottawa, especially those conveying hogs from the western provinces to Hull, and then transferred to Ottawa to be cleansed and disinfected. The manure from these cars was stored in an isolated place and burned to prevent any chance of spreading disease.

I have also kept in close touch with all the boundary points where stock cars from the United States are transferred from one railway to another, and have enforced ministerial order 33, section 3, which is, that all stock cars, whether of Canadian origin or not, and whether empty or conveying merchandise other than live stock, entering Canada from the United States, must, if not already showing evidence of having been so treated, be thoroughly cleansed and disinfected to the satisfaction of an inspector of this department; otherwise they will be returned to the United States.

There have been small stock pens erected at Bishop's Crossing, Valley Junction, Tring Junction, St. Sabine, and at several other small places on the various railways. At the Union stock yards, Toronto, several improvements have been made for the handling of live stock during the past year, and the company have constructed sixty-two new cattle pens, together with eighteen receiving pens. The Grand Trunk chutes have been extended by adding nine additional chutes, and they now have thirty-six unloading chutes. The Canadian Pacific chutes have been extended by adding nine, and they now have twenty-nine unloading chutes. There can now be unloaded sixty-five cars of live stock at one time.

The above cattle and receiving pens have all been paved. New horse corrals have also been constructed next to Keele street, adjoining the yards, with a capacity for five hundred head. The disinfecting yards belonging to the Michigan Central railway at Montrose, and the one belonging to the Grand Trunk railway at Bridgeburg have undergone some minor repairs, and are kept in good condition. The manure from stock cars is stored for a period of three months in these yards before being removed, to prevent any chance of spreading disease, as these cars are brought from points in the United States and cleansed and disinfected in these yards.

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During the latter part of the year my time was fully occupied in carrying out the embargo regulations against the introduction of foot-and-mouth disease from United States. I proceeded along the St. Lawrence river from Toronto to Montréal and organized a patrol to carry out the embargo regulations.

Later my time was fully occupied in supervising the handling, isolating, and transportation of remount horses from the United States. New open yards were constructed at Windsor and Toronto to accommodate five thousand remount horses in each place. A new yard was also erected at Dixie, near Montreal, to accommodate twelve thousand horses.

In conclusion, I would state that the different inspectors stationed at the divisional points where stock cars have been cleansed and disinfected have enforced ministerial order 37, and the officers in these divisions have had the co-operation of the different railways in this work.

I have the honour to be, sir,

Your obedient servant,

L. L. COOKE,

Chief Inspector Live Stock Cars and Yards.

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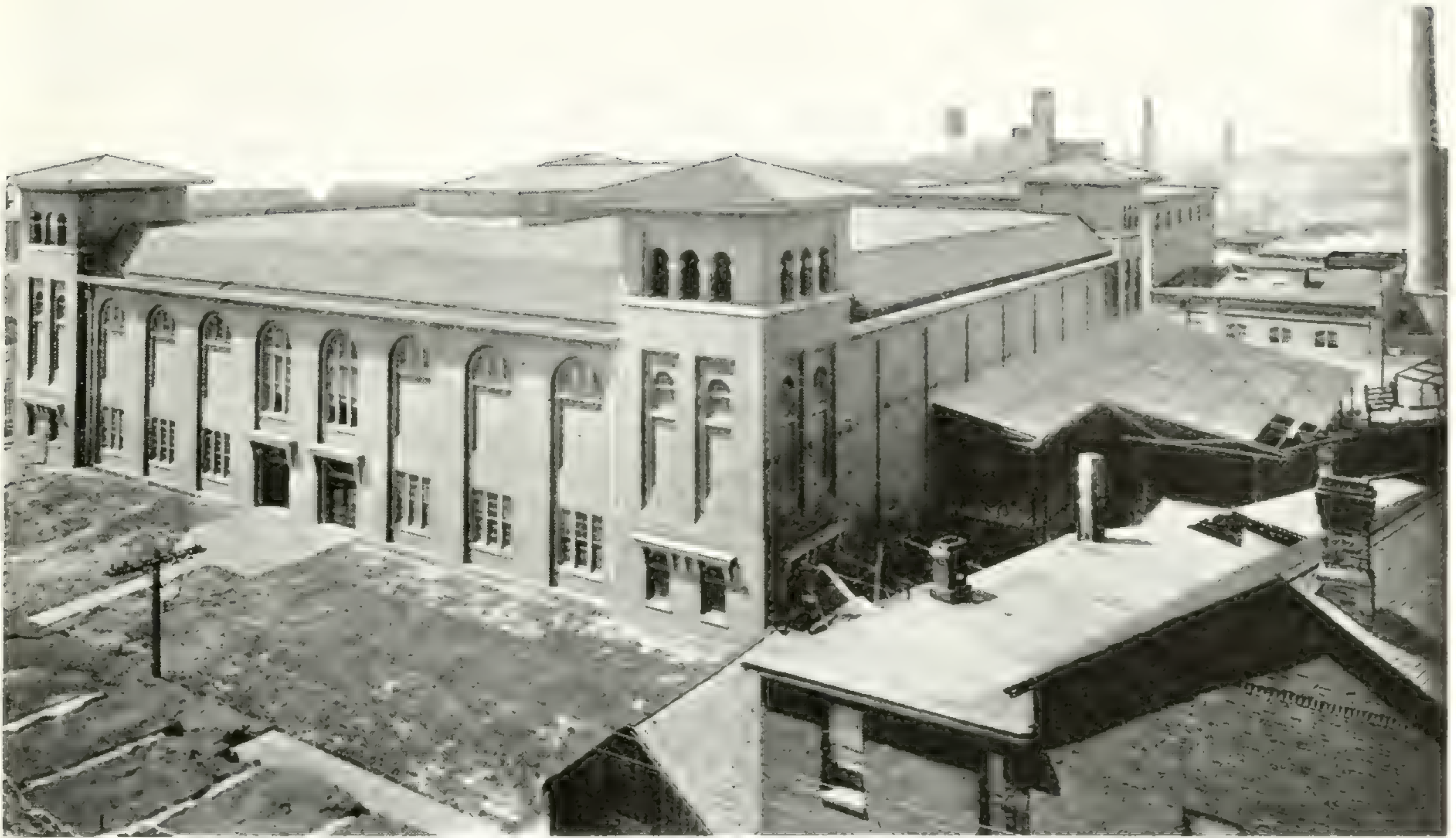
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Toronto Municipal Abattoir (front view).



Toronto Municipal Abattoir. Interior. Cold storage on the left. Killing floors on the right.



Toronto Municipal Abattoir. Interior view of one of the private killing floors. Meat inspector of the H. of A. Branch on duty.



Follicular mange.



Follicular mange.



Photo Dr. Jarvis.

FIG. 1.—Hyperplasia of spleen.

